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Paper Output Reaches New Record in 1936

Production of All Grades of Paper Estimated At 11,843,000 Tons, Which Compares With Previous High of 11,140,000 Tons In 1929 — Entire Paper Industry Averaged 82 Per Cent Operation of Capacity During Past Year

By M. C. Dobrow, Treasurer, Writing and Cover Paper Manufacturers Association

In 1936, the total paper production in the United States achieved a new high record for all time. Production is estimated at 11,843,000 tons, as compared with 10,506,000 in 1935 and with a previous high of 11,140,000 tons in 1929.

The new highs were confined largely to kraft wrapping and board grades, but printing papers (book, cover and writings) generally made gains corresponding to the gain in the volume of general business, but did not reach the 1929 levels.

Seller's Market Develops

The last quarter of 1936 witnessed a striking change in the paper industry. Almost overnight the psychology changed from a buyer's to a seller's market. Underlying fundamental forces had been pointing in this direction for many months, but it was not until the late fall that the market was generally willing to recognize that consumption and demand for printing papers were approaching the highest level in several years, and that pulp, the basic raw material, had become a scarce commodity at a rapidly increasing price.

Consumption of Writing Paper

Consumption of writing papers, of course, is closely related to the number of business transactions and the general volume of business. Federal Reserve Board index for 1936 averaged 105 (1923-1925 = 100), as against 90 in 1935, or a gain of 17 per cent, which was considerably above the expectations. The total gain of writing paper production was 18 per cent over a year ago.

Writing Paper Production Up

Writing paper production increased from 417,859 tons in 1934 to 481,083 tons in 1935, and 568,000 tons in 1936. This tonnage is still 7 per cent below the 1929 peak production of 607,590 tons.

Production, as compared with practical capacity of the writing paper industry, was 59 per cent in 1934, 68 per cent in 1935, and 78 per cent in 1936. In 1929, the industry, with a somewhat smaller capacity, was operating at 91 per cent. No new machines have been added for writing paper, but capacity was increased about 20,000 tons per year by improvements to existing machines.

The United States Census placed the capacity of all paper machines in 1934 at 13,888,310 tons. This capacity at the end of 1936 is estimated at 14,473,000 tons. There are now being built machines with an annual capacity of 488,000 tons of board and 155,000 tons of kraft wrapping.

For the year as a whole, the entire paper industry averaged 82 per cent operation of capacity. In the late fall, when increased demand was definitely under way, the industry was operating as much as 88 per cent of capacity, from which there has been little change to date.

It is now reasonable to assume that in 1937 not only will the entire paper industry establish a new level of production, but the volume of fine printing paper grades will also exceed the previous record made in 1929.

Increasing Costs

In the raw material situation, we expect to witness difficulties in 1937. The pulp markets of the world have long since passed from a buyer's to a seller's market. Increas-

U. S. CAPACITY AND PRODUCTION BY GRADES

Grade	1929 Capacity Tons	1929 Actual Production Tons	1929 Per Cent	1935 Capacity Tons	1935 Production Tons	1935 Per Cent	1936—Estimates Capacity Tons	1936—Estimates Production Tons	1936—Estimates Per Cent
Writing Paper	670,000	607,590	91	709,280	481,083	68	729,200	568,000	78
Cover Paper	32,000	28,072	88	48,670	20,806	43	48,600	24,000	49
Book Paper	1,700,000	1,497,912	88	1,790,250	1,226,395	69	1,840,000	1,407,000	76
Wrapping Paper ..	2,000,000	1,605,783	80	2,015,620	1,605,457	80	2,200,000	1,784,000	81
News Print	1,695,080	1,409,169	83	1,237,830	947,717	77	1,250,900	957,000	77
Paperboard	5,696,870	4,451,187	78	5,961,610	4,722,890	79	6,200,000	5,370,000	87
Tissue Paper	442,680	387,811	88	531,030	473,314	89	600,000	548,000	91
Building Paper ...	850,000	659,178	78	735,940	463,143	63	735,900	540,000	73
All Other Paper...	617,850	493,533	80	868,620	565,390	65	868,400	645,000	74
Total	13,704,480	11,140,235	81	13,898,850	10,506,195	76	14,473,000	11,843,000	82

CAPACITY AND ACTUAL PRODUCTION OF PAPER MACHINES IN THE UNITED STATES

Courtesy of M. C. Dobrow, Treas., Writing and Cover Paper Mfrs. Association.

ing use of rayon throughout the world, coupled with an increased demand because of larger production of fine printing papers have made the supply situation for bleached sulphite exceedingly precarious from the point of view of the buyer who is not covered by definite contracts for 1937 and 1938 requirements.

A world-wide scarcity of bleached sulphite has developed, because competitors outside the paper industry have tremendously increased their consumption. A birdseye view of the change in the situation is visible from the following rough estimates of production and consumption of bleached sulphite.

The total world production in 1935 was approximately 3,000,000 tons. Of this, the paper industry throughout the world was using somewhat more than 2,000,000 tons annually. Rayon and Cellophane were using over 500,000 tons. This left plenty of room between supply and demand.

In 1937, total world production of bleached sulphite is estimated at somewhat under 3,500,000 tons. On the demand side, we have an increase in production by the paper industry of at least 20 per cent over the 1935 production, making the estimated consumption in the neighborhood of 2,500,000 tons. In rayon and Cellophane, where we have more definite world figures, the indicated consumption for this year, is not much less than 1,000,000 tons.

Production of rayon in the United States in 1935 was 254,000,000 pounds. In 1936, production was 275,000,000 pounds, but consumption was 290,000,000 pounds practically eliminating all stocks. The expected production for 1937 is 330,000,000 pounds.

World production of rayon in 1935 was 1,004,000,000 pounds; in 1937 it is expected to be 1,600,000,000 pounds with an additional 120,000,000 pounds for Cellophane. Increased use of bleached sulphite in the production of nitrates in Europe should also be mentioned, although no estimates are available.

Thus, with a possible consumption this year of 3,500,000 tons of bleached sulphite against a possible production not exceeding this amount, it is evident that supply and demand are in too close balance to be comfortable, and may easily develop shortages at some points.

Bleached Sulphite Prices Rising

A year ago the contract and spot prices for bleached sulphite for paper making were approximately the same at $50 per ton. Most domestic contracts for the second quarter of this year range from $58 to $62 per ton, depending on the grade. Specialty grades of some pulp mills are somewhat higher. Spot supplies of bleached sulphite have been sold at $75 to $78 per ton. Firm contracts for imported bleached sulphite for 1938 delivery have been made at $72 to $75 per ton.

The spot prices for bleached sulphite are probably an indication of what may ultimately be expected as the contract or going price of bleached sulphite used in paper making unless and until new bleached sulphite capacity is developed.

Generally speaking, the spot market for bleached sulphite is higher than the price for papers made from these fibers with the cost of conversion and operation eliminated.

Machine Capacity Adequate

The paper industry is entering a period of prosperity. Such a happy state can be maintained as long as demand is sufficient to fill reasonably the existing machine capacity. Under similar conditions in the past, the extensive addition of new paper machines made for a condition once called "profitless prosperity". New demands for paper products for new uses must, of course, be met with additional paper making facilities where the present equipment is inadequate, but in the printing papers generally, there is no normal demand in sight that cannot be adequately supplied by existing production facilities.

Year	Capacity Tons	Production Tons	Per Cent Idle
1920	8,540,000	7,334,600	14
1921	8,614,200	5,431,265	37
1923	9,725,300	8,029,482	17
1925	11,575,500	9,182,204	21
1926	12,000,000	10,000,000	17
1927	12,536,000	10,002,070	20
1928	13,027,930	10,403,338	20
1929	13,704,480	11,140,235	19
1930	13,900,030	10,169,140	27
1931	13,971,700	9,381,840	33
1932	13,728,040	7,997,872	42
1933	13,728,040	9,190,017	33
1934	13,888,310	9,186,598	34
1935	13,898,850	10,506,195	24
1936	14,473,000	11,843,000	18

Increased Demand for Kraft Paper In 1936 Brings About Oversold Condition

By L. C. Anderson, Vice-President, Sorg Paper Co.

The manufacturers of kraft paper probably suffered more financial losses during the depression than those in any other branch of the paper industry. Reference to the financial statements, where available, of the various paper manufacturers will verify this statement.

The announced delivered price of kraft wrapping paper in the summer of 1932 was but slightly above 2 cents a pound. Many sales are known to have been made below 2 cents a pound delivered, and the trend was toward bankruptcy of the manufacturers.

Fortunately wise counsel prevailed at that time and the Industry started working itself out of its desperate situation, so that by the middle of 1933 prices had been gradually raised to a point where most of the manufacturers could operate at a slight profit.

Two New Problems Confronted

This condition without doubt was helped by a gradual increase in the demand for kraft paper during that period. This gradual increase in the demand continued until the fall of 1936, when the Industry found itself confronted with two new problems, one a material increase in the cost of producing paper, the other an unusually large increase in the demand for its product.

The self-contained mills found all their supplies, including wood, had suddenly increased in cost. The converting mills had a similar experience with regard to supplies, and also found a great scarcity existed in the supply of kraft pulp, and that its price had greatly increased almost overnight.

Both types of manufacturer found it necessary to increase wages and both found the social security tax quite an additional burden. Such price increases as have occurred recently have been the logical results of these conditions.

Since costs are still advancing, it is only natural to pre-

sume there will be further increases in the prices of paper in the near future.

Fair Distribution Planned

The increase in demand has brought about an oversold condition on the part of most of the mills, and a recognition by them of the necessity of formulating plans to provide a fair distribution of their product to the market, and at the same time prevent speculative buying. Most of the larger factors in the Industry have already placed such plans in operation.

The Industry is quite conscious of the problems which will result from the operation of the kraft paper and board mills which are now being built, or have been announced for building in the South.

Those who have studied the problem most thoroughly seem to be agreed on the following points: The ability of the market to absorb this tonnage will depend on general economic conditions, and a continuance of the present growing demand for commodities.

Kraft paper and board are used almost entirely in the packing of other commodities; hence their consumption is largely dependent upon the movement of these commodities. If the rate of increase in consumption of kraft paper and board which has prevailed since 1934 continues through the next two years or more, the announced increase in production, great as it is, will be absorbed by the market.

If the economic prognosticators are wrong and we are to have a recession instead of an increase in general business, then we will have all those problems to contend with which accompany an overproduced market.

Aided by Business Expansion Chemical Industry Makes Favorable Showing in 1936

By Guy A. Gardner, Manager, Chemical Division, M. Gottesman & Co., Inc.

The general expansion of industrial activity during 1936 was shared by the chemical manufacturers, the chemical consuming industries calling for increasing supplies of heavy chemicals as the year went along.

This expansion in the industries that are consumers of chemicals had a marked influence on production and most of the chemicals used by paper and pulp manufacturers were produced in greater volume and at slightly higher prices generally than in the preceding year.

Many other raw materials that are of interest to the paper manufacturer were in strong demand at rising prices, notably Rosin and Casein.

Chemical manufacturers report larger tonnage movements during 1936 of Chlorine, Soda Ash, Caustic Soda, Sulphate of Alumina, and Salt Cake, than for the preceding year.

This increase was to a considerable extent due to the stepping up of the operating schedules of the pulp and paper mills.

Production Expands

It is estimated that production of heavy chemicals during the last year was approximately 15 per cent larger than in 1935, and barring serious labor difficulties or other major disturbances, the indications are that the current year will call for still greater production of the more important chemicals used by paper and pulp manufacturers.

The many new mills now under construction will require large tonnages of various chemicals during the next twelve months, thus giving the chemical manufacturers many new outlets for their products and making the pulp and paper industry one of the largest consumers of industrial chemicals. The chemical manufacturers have every reason to feel satisfied with the business done during the last year, and from all present indications, the outlook for 1937 appears to be a bright one.

Chlorine

There was an active and growing demand during the year, especially from pulp manufacturers, who were experiencing an insistent call for larger tonnages of Bleached Pulps.

The recent flood conditions have also increased the demand for Chlorine and Bleaching Powder. Prices remained unchanged during the year at the contract schedule put into effect in 1935.

Sulphate of Alumina

A good demand was reported for Sulphate of Alumina, both the commercial grade and the iron free, during the year. Prices were firm with little or no change from 1935 schedules.

However, with constantly increasing demand, the market tends to become firmer with an outlook for somewhat higher prices in 1937.

Soda Ash

Soda Ash moved in increasing volume all through the year, and production would no doubt have been still larger if it had not been for the labor troubles existing in the Flat Glass industry during the year.

Prices were firm and without change during 1936.

Sulphur

The production of Sulphur during 1936 was approximately two million tons, an increase of about 25 per cent over 1935 figures.

The greater part of this increased production was accounted for by the growth in the export demand during the year, although larger tonnages were reported being shipped to the acid and pulp manufacturers.

While the market was very firm there was little or no price change recorded during the year.

Salt Cake

The Sulphate mills called for increased tonnages of Salt Cake as their operating schedules were stepped up.

Domestic production and the quantities imported during last year were considerably greater than in 1935.

It is interesting to note that in addition to its use in the Glass and Pulp industries, new outlets are being developed for Salt Cake and production will undoubtedly have to be increased during the next year or two, to take care of the additional demand.

Prices were firmer, although contracts for 1937 were at about the same basic prices as in 1936.

All Grades of Paperboard Industry Exhibit Decided Improvement

By Grafton Whiting, Statistician, National Paperboard Association

A review of the Paperboard Industry for 1936 shows an improvement in all its branches beyond the optimistic forecasts made at the first of the year. A new high record of production has been made with improvement in plant efficiency and general price levels.

For the first quarter disappointment was felt that the demand of prior months had not been better sustained. The increase of but 6 per cent over the like period in 1935 was considered too small. The feeling was better when the half year mark showed a 10 per cent gain, and when the year closed with some 17 per cent (estimated) growth satisfaction was freely expressed.

An important addition to the National Paperboard Association occurred early in the year when a number of the Sulphate-Kraft mills producing paperboard grades joined in the Association's activities. These mills, located for the most part in the South, have as their customers the same converters of paperboard that are served by many of the Northern mills and the industry problems are the same. The volume has strengthened the Association in treating with industry matters and has broadened our statistical review in its representation.

Paperboard

"Paperboard" is a term used to denote the product of a multi-cylinder or Fourdrinier paper machine, when the output is twelve points (12/1000 of an inch) or more in thickness. Calipers under twelve points are classified as paper, in contrast with the thicker grades known as "board".

The Paperboard Industry is composed of manufacturers of board which is used in the fabrication of shipping containers, folding cartons and rigid boxes. It excludes certain grades such as card boards, cover board, binder's board and leather board, but includes Corrugating Material (.009 inch in thickness) and some of the lighter weights made for the corrugated box industry.

The principal grades and tonnage produced in 1935 are as follows:

Grades	*Tons*	*Percent*
Liner Boards	1,432,600	32.0
Chip for Currugated and Solid Fibre Boxes	276,700	6.2
Corrugating Material	587,900	13.2
Sub-Total Containers	2,297,200	51.4
Folding Boxboard	1,027,900	23.0
Set-up Boxboard	550,300	12.3
Other Grades, Misc.	596,700	13.3
Sub-Total	2,174,900	48.6
TOTAL	4,472,100	100.0%

The gain of about 17 per cent in 1936 over the previous year applies fairly well to each of the several grades

SEASONAL VARIATION

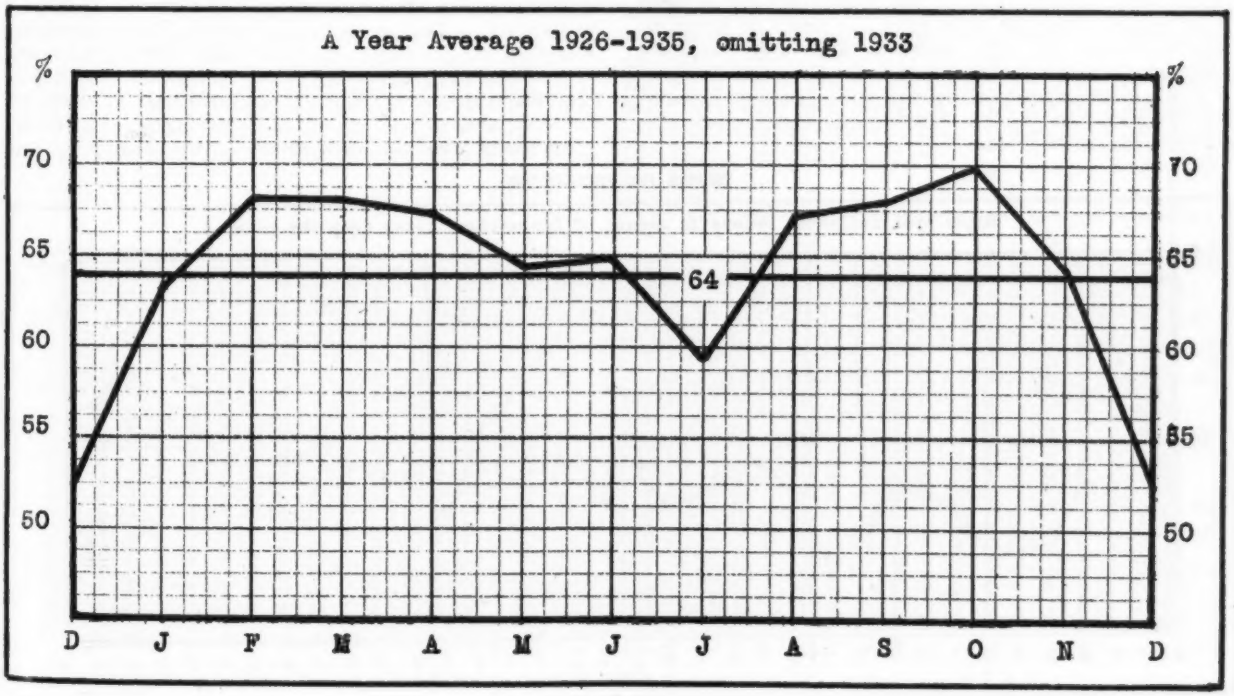


CHART 1

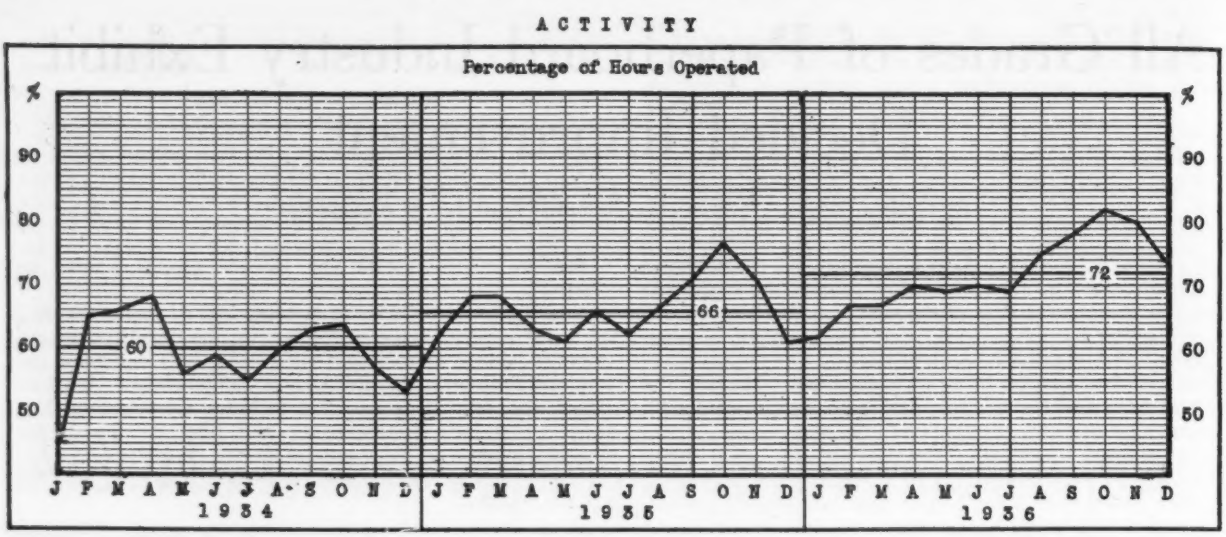


CHART 2

except for a lesser percentage for Chip and Set-up boxboards.

Raw Materials

The principal raw materials entering into the manufacture of paper-board are waste paper stock and prime pulp. Coal and power are large items, but are considered as a part of the conversion costs.

Waste Paper Stock

The amount of waste paper stock used during 1936 is estimated at 3,500,000 tons at a value in excess of $25,000,000. Waste papers are collected by dealers from department stores and office buildings and gathered throughout the large cities and in the smaller towns. The volume obtainable from stores and offices varies with general business activity, but the flow from collectors is largely dependent upon the price paid. In times of heavy requirements by the mills prices advance and conversely fall under a reduced demand.

Storage of paperstock by the mills tends to equalize the variations and added warehousing capacity has been built during the past year.

Pulp

Pulp is second in importance and while less in volume is higher in cost per ton. The supply of pulp comes from imports from Canada, Finland, Norway, Sweden, etc., and from domestic production. While there are no separate records of pulp consumption by paperboard mills, the Department of Commerce, Bureau of Foreign and Domestic Commerce, publishes a summary of imports and the American Paper and Pulp Association issues a statement of domestic production.

The following is given as a preliminary figure for the first ten months of 1935 and 1936.

Total Pulp Imports and Production

	Tons	
Items	*10 Months 1935*	*10 Months 1936*
Imports	1,491,272	1,860,564
Domestic	3,652,404	4,260,105
Total	5,143,676	6,120,669
Less Exports	131,982	170,783
Net Available	5,011,694	5,949,886

Assuming that the inventories at the beginning and

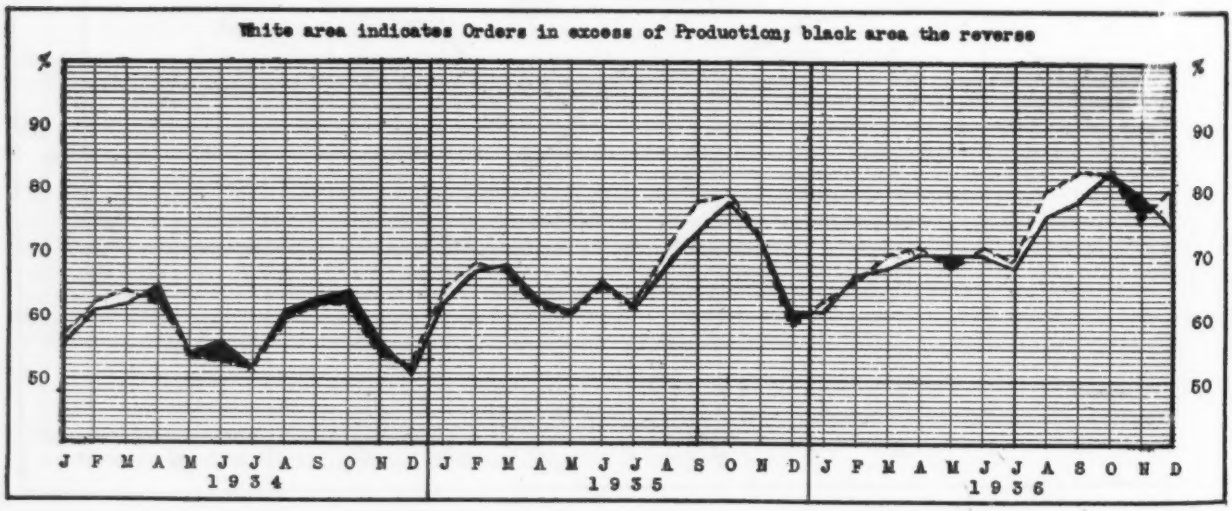


CHART 3

ending of the periods are the same, there was an increase of 19 per cent in the pulp consumed.

Seasonal Variations

The buyers of paperboard are largely fabricators of packages, including shipping containers, cartons and paper boxes, who use the board in filling their customers' orders. The box plant operations are scheduled to meet the demand of the many packers and shippers of a wide assortment of commodities. These demands vary with the seasonal use of the articles to be shipped and thus the whole industry is subject to periods of increase and decrease in activity. It is impractical to manufacture any appreciable amount of stock ahead of the demand because of the many different sizes and grades required. Facilities, however, must be available to carry the peak load. The influence of these seasonal swings as they affect the paperboard mills has been followed through a series of years and plotted to show the months of greater or lesser activity.

The seasonal variation Chart No. 1 represents the trends based on a period of nine years (1926 to 1935) excluding 1933 (because of the abnormal conditions then prevailing.)

With a knowledge of the seasonal changes, paperboard mills are in a better position to schedule their operations and know that when the periods of decline come, it is not due to a general recession of business, but the normal expectancy each year to be offset by increased volume when the upward trend begins.

In periods of general industrial recovery such as is now being experienced, the seasonal trends are less marked. This is due to a better feeling of confidence with commitments made farther in advance. The mills build up larger back-logs of orders and are able to plan their production programs at a more stable rate.

Activity

The activity of the paperboard mills is an expression of the time operated measured in inch hours. The record inch hours, or 100 per cent, is computed for each machine by multiplying the width of the last drier on the machine by 144 (6 days). Thus a machine measuring 100 inches would have 14,400 inch hours for a full week's operation of 6 days. The actual hours of operation as reported is multiplied in turn by the width and the record inch hours divided into the actual, gives the per cent of activity.

Chart No. 2 is drawn for the years 1934 to 1936 inclusive and the weekly activity is here consolidated into months.

A comparison of Chart No. 1 (Seasonal Variation) with Chart No. 2 (Activity) will show how the years 1934 to 1936 varied from the normal or anticipated activity. It will be noted that the last six months of both 1935 and 1936 were unusually active. This is attributed to the influence of the general business recovery as stated above.

Orders and Production

Incoming orders expressed in tons are contrasted with production to procure a statement of demand and supply.

Chart No. 3 shows this comparison by reducing each of the series of figures to a percentage obtained by dividing the tonnage received and the production made by the rated capacity of the mills. During periods in which the incoming orders are in excess of production the intervening area is white; where the reverse occurs the area is in black.

During the three years, 1934-1936, the demand and supply have followed fairly close to each other, but on a consistently higher level. This reflects the improvement experienced by the industry and follows the general business recovery. The close of 1936 shows a strong increase in demand and at the present writing, the incoming orders are still being received in large volume.

Days to Run

The "Days to Run" is an expression used to designate the time necessary to fulfill incompleted orders on hand assuming that production is continued at full operating rate. It is in substance a statement of the inventory of the order file taken at regular intervals and therefore comparable one period with another.

Chart No. 4 illustrates the changes in the days to run monthly during the past three years.

The average days to run in 1934 was 6.3 days; in 1935 6.7 days; and in 1936 7.5 days.

The operation of a paperboard machine, particularly one that is running on boxboard grades, can be scheduled to better advantage where a large bank of orders is awaiting fulfillment. This economy in operation is effected by combining orders of like specifications and thereby increasing the length of the run on a given grade calling for the same furnish of raw materials. The loss in time and of board in changing from one grade to another is an important item in final costs.

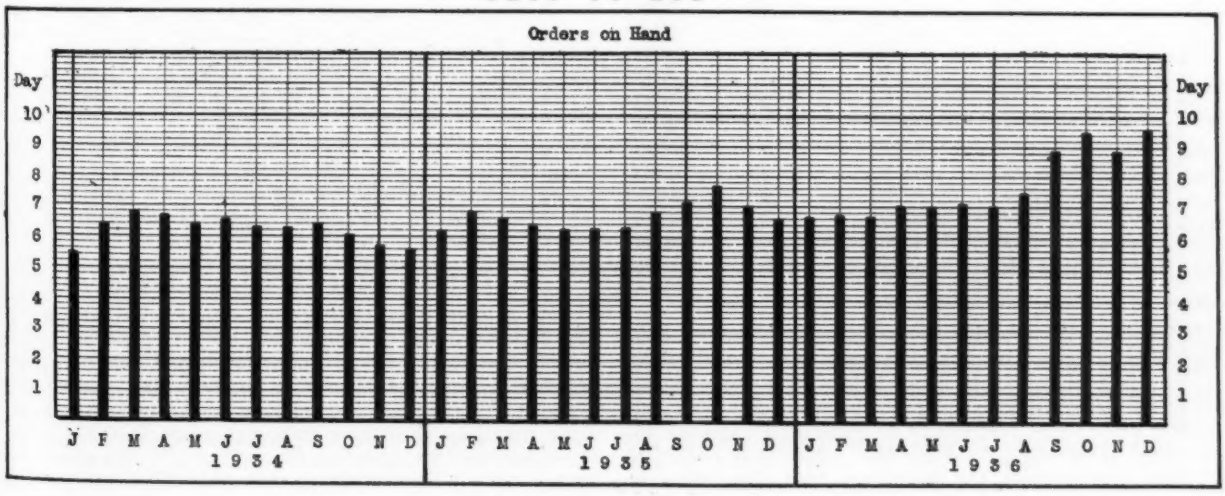


CHART 4

1936 Production

The production of all grades of paperboard is obtained each year by means of a census taken of all mills known to be producing grades which fall within the scope of the industry. During the past ten years the record thus obtained is as follows:

1927	3,444,300	tons
1928	3,833,800	"
1929	4,222,000	"
1930	3,906,800	"
1931	3,743,800	"
1932	3,280,800	"
1933	3,885,700	"
1934	3,901,000	"
1935	4,472,100	"
1936 (Est.)	5,233,000	"

The total production for 1936 is an estimated figure pending the completion of the census. A comparison of the tonnage reported by identical plants for the first half of the year with that of the last half shows that a change has taken place in the periods of most demand.

Periods	*1928-1932*	*1934*	*1935*	*1936*
1st 6 mo.	51.7%	50.3%	47.4%	46.7%
2nd 6 mo.	48.3	49.7	52.6	53.3
Full Year	100%	100%	100%	100%

The strong demand which developed in the second half of 1935 and 1936 caused a reversal of the relative percentages experienced in prior years. This might indicate that the normal seasonal trend has changed, but viewed from the standpoint of general business, it is evident that the strong recovery trend has been more marked at the close of the year than in the opening period. Advancing prices and fear of further increases which are earmarks of a recovery period induce buyers to anticipate their wants and place orders ahead.

Prices

The prices of the four principal grades made by the industry are given below and represent the price as published at the beginning of each month.

*Prices Per Ton Delivered Chicago Area**

Month	White Patent Coated News	Single Manila Lined Chip	Chipboard Sheets	Test Liners
Jan., 1936	$57.50	$45.00	$35.00	$40.00
Feb.	57.50	45.00	35.00	40.00
Mar.	57.50	42.50	35.00	40.00
Apr.	57.50	45.00	37.50	40.00
May	60.00	47.50	37.50	40.00
June	60.00	47.50	37.50	40.00
July	60.00	47.50	37.50	40.00
Aug.	60.00	47.50	37.50	40.00
Sept.	60.00	47.50	37.50	40.00
Oct.	60.00	47.50	37.50	37.50
Nov.	60.00	47.50	37.50	40.00
Dec.	60.00	47.50	37.50	40.00
Jan., 1937	62.50	50.00	40.00	40.00

*From Official Board Markets, 228 North LaSalle Street, Chicago.

It has been the practice in the industry to accept contracts for three to six months' supply with specifications of grade and size to be furnished later. This policy causes prices as published to change slowly from one period to another due to the irregularity of expiration dates of the contracts outstanding. With the uncertainty of raw material prices which the mills now face, the policy in reference to forward contracts is being changed with limits of thirty to sixty days becoming the custom. The advance of $2.50 shown for January, 1937, is insufficient to compensate for the increase in raw materials costs already announced. A further upward change in board prices may therefore be expected.

Prospects for 1937

With the volume in prospect for the first quarter of 1937, paperboard mills should be in position to operate at a high rate of activity. Furthermore, the demand is so well distributed over the different grades of board that all branches of the industry should benefit. A full schedule of activity results in decreased operating costs since the heavy overhead charges incidental to the large investment in plant and equipment is distributed over more productive hours than where a lack of demand limits the running time.

In the second quarter the seasonal trend is downward, but it is anticipated that this year it will be less in evidence than normally. For the last half of 1937, unless some major change takes place in general business, the industry is looking forward to another record breaking volume.

When the past five or six years are reviewed and the heavy losses then incurred are given consideration, a year or two of prosperity seem but a just reward for those who had to struggle so long to keep their properties intact and give continuous employment. Much renovation and replacement of obsolete equipment has been done during the past year, but much is still to be undertaken. A period of prosperity to permit the financing of these changes is essential if the paperboard mills are to maintain the high standard of efficiency and quality of output to which they have always held.

Sources of Liquid Rosin Sought

The Forest Products Division of the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., reports that it has received during the past few months several inquiries for information as to domestic sources of "liquid rosin".

Some difficulty seems to have been experienced by the potential purchaser in locating suitable sources of this product and the Forest Products Division will be glad therefore to refer any future inquiries for the product to any interested "liquid rosin" manufacturer.

"Liquid rosin" is a by-product of the sulphate pulp industry and is recovered from the liquor after the cooking is completed. It is used in a number of industrial products and by a number of industries such as in roofing and waterproof papers, printing inks, etc.

Sweden with its large sulphate pulp industry has heretofore been one of the chief sources of "liquid rosin", or tall oil, and a considerable amount has been imported into the United States each year from that country. It is now reported, however, that the total output of the product in that country for the coming months has already been sold and it is for this reason that the inquiries as to domestic supplies are being received.

Detroit Paper Products Profit

Detroit Paper Products report for quarter ended December 31, based on a comparison of the year and nine months statements $14,155 after taxes and charges, compared with net profit $18,864 in the preceding quarter and net loss $4,403 in the last quarter of the preceding year. Year ended on the above date, net profit $166,674 after the above charges, equal to 79 cents on 210,000 shares of capital stock. This compares with $119,615 or 57 cents a share in 1935.

Practically All Grades of Paper Stock Display Marked Improvement

By Walter R. Hicks, of Daniel M. Hicks, Inc., New York.

As we tuck 1936 away in the moth balls, let us recapitulate. Years are no longer just measures of time, they are chapters in the progress of civilization. The formula that governed existence under the old order of things, has become obsolete and we are somewhat appalled at the remedies proposed and in force. It draws on the fund of your imagination or any other funds you may have. In spite of this observation, the analysts, economists and statisticians arrive at the conclusion that '36 was a successful year. There has been a transition from the hurly-burly to the topsy-turvey and then on to the jolly well. The deterrents are driven from the corner, and prosperity makes the turn into the highway of recovery.

Cavalcade Passes In Review

As the Cavalcade passes in review, there is a distant echo of "Happy Days Are Here Again" and the crowd joins in that festive song, "Pennies from Heaven." We see the A.A.A., drop from the ranks; the Act that put farming on the basis of diminishing return, diminished production with increased returns. This may be cockeyed economics, but it is ultra agriculture.

We see the N.R.A. collapse, formerly known as N.I.R.A., whose battle cry was "Nira my God to thee." It stood for fair competition, governed by industrial codes, with conscience for its key and grounded on the shoals of human frailty.

And then comes the election, wherein Susanna was beseeched not to cry and we behold the spectacle of the elephant shedding crocodile tears in a campaign that was waged in a jungle and everybody out of step but Maine and Vermont. This is not a pageant but a demonstration with the spirit of '76 dominating '36. We harken back to Plymouth Rock, and the "Rock of Resource" and when rock meets rock, it rocks the nation.

We see business get into stride with prosperity and the major industries swelling to proportions that parallel previous records and in some cases surpassing them. We see a condition reflected in the electric power consumption, car loadings, building permits, retail sales, and better credit facilities, all of which tell the story of improved business.

Paper Stock had been having dress rehearsals, but in '36 it broke out into a real performance. General conditions naturally affected all business and Rags and Waste Paper came in for their share. Supply and demand really asserted itself, with demand overtaking and exceeding the supply, with the result that the suppliers took to gardenias and the mills to aspirin. Let us first consider the Rags, for in the excitement they compel our attention.

Rag Prices Advance

Rags have flown at the mast-head all year, new Rags reaching the peak, with Bleached grades advancing as the year progressed. Colored Rags did well in the early months, in sympathy with high priced Roofing; Shirt Cuttings, Unbleached Muslins, Light Flannelettes, Silicias, Blue Overalls and Percales going strong at the close. Roofing and Fiber Rags were in good demand in the opening months, but eased off towards summer and picked up again in the Fall.

White Shirts went from $7.50 to $8.50 delivered the East, Unbleached from $8.25 to $9.25, Silicias and Light Flannelettes from about $5.50 to $7.00, Blue Overalls from $7.00 to $7.50 delivered the East. Unbleachable grades did not fair so well although they showed an advance over the year, New Darks and Cottonades for paper making reaching $3.25 delivered consuming mills. The export market absorbed some of the Colored grades and prices on the whole were firm throughout.

The export markets took a bigger tonnage of Old Whites and White Shirt Cuttings than had ever been exported in previous years. The situation abroad was such, that they not only consumed tonnages that formerly came to this market, but prices reached limits that permitted grades to be shipped to the other side to better advantage than the home market afforded. The domestic mills used Old Whites in a moderate way, at varying prices, but the majority went abroad and the export price largely governed the price to the mills here.

Roofing reached its peak along about February, when No. 2 Roofing brought $2.05 f.o.b. New York. The market eased off and prices were gradually forced down to $1.10 New York during the Summer months and at the turn of the year were bringing $1.60, New York. Foreign Dark Cottons, prime quality, sold for $2.40 in the early months dropped off to $1.75 in the Summer months and were going strong at over 2 cents per lb., at the close. When prices reached the top in the early part of the year, the Roofing mills picked up large tonnages of Thirds and Blues which had accumulated because of the insufficient demand on the part of the Fiber mills. This left a shortage of Rags of the Fiber grades and mills were compelled to advance their prices proportionately in order to cover on their requirements.

Waste Paper Buoyant

And Waste Paper beamed in the sunlight of prosperity. Beside the increased demand resulting from increased business, the pulp shortage greatly enhanced the need of Waste Paper, White Envelope Cuttings and Kraft Envelope Cuttings leading the way, with Book Stock, Soft White Shavings, and Ledger Stock following.

The increased consumption on the part of the board mills doubled the value of Mixed Papers and News with Old Kraft Papers, Manilas and White Blank News showing substantial gains. White Envelopes went from $2.25 to $2.75, Kraft Envelopes from $2.00 to $2.35, Soft White reached $2.20 from $1.75, Magazines went as high as $1.05 from a low of about 55 cents and other grades in sympathy.

Folded News at the outset of the year was 25 cents to 30 cents New York, and went up by slow motion until the price at the turn of the year was 60 cents and Mixed advanced at the same rate going from 25 cents to 50 cents. There was also a demand abroad throughout the entire year for such grades as Hard White, Soft White, Kraft and good sized tonnages of these found their way to Europe with a moderate call for some of the other grades such as Tabulating Cards, New Corrugated, etc., etc. The export of Waste Paper was a factor and held up until the last quarter, when prices hit levels in the domestic market that were higher than the limits abroad. At the close of the year, some grades were being imported, as the demand increased here and prices permitted moving stock this way.

Production and Distribution of Wood Pulp Greatest In History of Industry

By O. F. Swanson, Sales Mgr., J. Andersen & Co., and the Pulp and Paper Trading Co.

Based upon available data from various and apparently reliable reports, it is evident that 1936 will go down in history as the greatest year so far in regard to production and distribution of wood pulp. All kinds of Chemical pulp were in brisk demand and Kraft pulp and Bleached Sulphite pulp enjoyed something like a boom during the second half of the year.

Prices Advance by Leaps and Bounds

Figuratively speaking, prices on imported Chemical pulp advanced by leaps and bounds, and this undoubtedly had a tendency to encourage the expansion of the woodpulp industry in the South and elsewhere. The building of new pulp mills in this country was started, and the erection of two was completed. Other mills increased production, and one kraft mill on the Pacific Coast resumed operation after a shutdown of several years with a daily production of about 175 tons of Unbleached and Bleached Sulphate pulp.

It is estimated that approximately $100,000,000 has been provided for modernization of existing mills and new developments in the U. S. A. These expenditures are not altogether for pulp mills, but also for paper and board mills, most of which are connected with pulp mills.

Kraft Pulp Situation

The increase in the yearly production of Kraft pulp in this country by the end of 1938 is estimated at about 1,250,000 tons, or approximately 68 per cent above the tonnage produced during 1936. Europe is also increasing production, and it is surely only a matter of time when the effect of this tremendous increase will exert its influence on the market, but probably not to the extent predicted by those less optimistic concerning the future.

We must reckon with the fast growing demand for all kinds of woodpulp and, especially, for Kraft pulp. Since the practicability and popularity of cement bags made from Kraft paper has become universally known, and is an established fact, the requirements of Kraft pulp have rapidly developed.

Quality of Southern Kraft

The quality of Southern Kraft pulp compares favorably with the fiber made from Northern wood, although it has been suggested that the latter has special qualities which the Southern fiber does not possess. On the other hand, the Southern pulp is supposed to make a lighter board per volume, which has its advantages for certain purposes, and where this particular feature of the finished product, with lowest weight possible, is required.

There is no doubt concerning the valuable properties of Southern wood for Chemical pulp, but there still appears to be some question as to whether entirely satisfactory Mechanical wood pulp can be made from Southern pine. Any obstacles in this respect would probably be overcome, should necessity force developments in this field.

Drought Retards Ground Wood Production

Owing to the unusual drought in several sections of the world during the summer months, many Ground wood mills were at that time forced to operate at a fraction of capacity, which resulted in a strengthening undertone of the mechanical pulp market later in the year. Consequently, this situation had, in a way, a beneficial effect on the market, because it facilitated movement of tonnage in storage during the summer, and helped to advance prices, which for a few years had been considered below those adequate to enable the manufacturer to get a new dollar for an old one.

Outside of this curtailment, practically all pulp mills were operating at full capacity throughout the year but, in spite of this, the demand for Chemical wood pulp exceeded supplies, which condition increased in severity from month to month as the year advanced.

Pulpwood Costs Higher

The rise in cost of pulpwood and the other raw materials required in the manufacture of wood pulp and, in a lesser degree, the advance in wages and salaries, together with some labor difficulties in shipping circles, especially on the Pacific Coast, may have had a detrimental effect on profits but, in spite of this, some operators showed excellent results in this respect also.

However, this was not in general keeping with the increased production, and the net profit per ton of pulp probably suffered a slight decrease, compared with that of the year preceding. Nevertheless, the results obtained by the wood pulp industry last year should be considered highly satisfactory, and it is reasonable to assume that no up-to-date mill had cause to complain seriously on achievements accomplished.

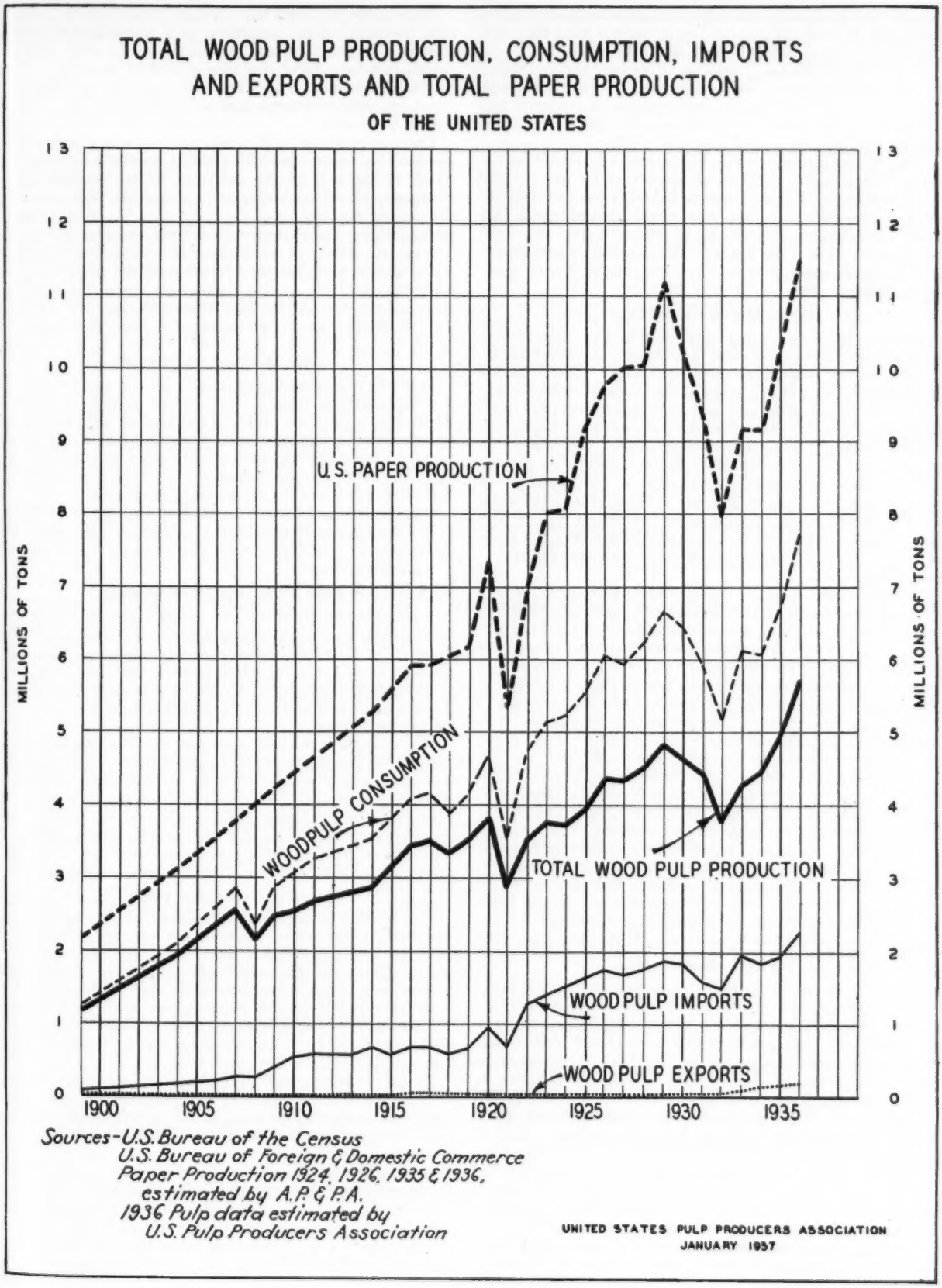
If the pulp business could be taken as a barometer on the paper business, the two combined were on the whole never better for many years past than last year and, according to present and most pleasing indications, the trend still favors continued improvement in a great many ways, although this might not be the case with the question of stabilizing prices, which played a very prominent role in wood pulp circles for several years past, but finally had its "nose snubbed" last year.

Two Sales Policies

The partial departure from the former policy concerning this matter refers mainly to European pulp, as the American and Canadian manufacturers were, and still seem to be, in favor of pursuing a more conservative policy regarding price advances than the one apparently adopted by our friends abroad.

Be that as it may, the fact remains that present contract prices on a quarterly basis are as a rule considerably lower on American and Canadian pulp than those at which European grades are now selling for deliveries over the same periods but, after all, there is the old proverb:—"Make hay while the sun shines" and, while the buyers of Domestic pulp no doubt appreciate the attitude taken by the Domestic pulp manufacturers, the fact must not be overlooked that several users contracted for European pulp at fixed and to them supposedly advantageous prices on tonnage for deliveries over the whole of this year and, in some cases, also well into next year.

Consequently, it is reasonable to assume that Domestic pulp manufacturers considered it only fair to cooperate with their customers to the extent of advancing their prices


TOTAL WOOD PULP PRODUCTION, CONSUMPTION, IMPORTS AND EXPORTS AND TOTAL PAPER PRODUCTION
OF THE UNITED STATES
MILLIONS OF TONS
MILLIONS OF TONS
0
1
2
3
4
5
6
7
8
9
10
11
12
13
1900
1905
1910
1915
1920
1925
1930
1935
U.S. PAPER PRODUCTION
WOODPULP CONSUMPTION
TOTAL WOOD PULP PRODUCTION
WOOD PULP IMPORTS
WOOD PULP EXPORTS
Sources-U.S. Bureau of the Census
U.S. Bureau of Foreign & Domestic Commerce
Paper Production 1924, 1926, 1935 & 1936,
estimated by A.P.& P.A.
1936 Pulp data estimated by
U.S. Pulp Producers Association
UNITED STATES PULP PRODUCERS ASSOCIATION
JANUARY 1937

slowly, and gradually, although they also could, of course, have sold at fixed prices over longer periods than they did, should they have deemed it advisable to do so.

Which of the two sales policies is the best for the industry can only be considered as a matter of opinion because data of any reliable kind on this question is evidently not available. Both have their good points, together with advocates in favor of one or the other policy.

Steady and uninterrupted production is however, something they all agree upon as an important factor not only for maintaining uniform quality but also for satisfactory sales arrangements. This was again demonstrated last year. The qualities furnished by almost every pulp mill were better than ever before. Mechanical improvement and technical advancements have also played major parts to accomplish this.

Skilled Mill Workers "Tops"

Besides, the men in the mills have had an opportunity to keep themselves in training and top-notch condition, on account of the continuous operation of the mills. Skilled and well-trained workers, regardless of their positions, are one of the greatest assets, and it is quite generally conceded that the present crew in the pulp mills is "Tops."

Some manufacturers are strengthening their forces in preparation of the anticipated greater activity in the industry and, on the whole, the existence of the workers has recently been made more pleasant and less dangerous than during former years. The practical absence of strikes, and labor trouble in pulp mills last year indicate that a feeling of friendship and cooperation exist between employers and employees.

Whether the so-called "New Deal" movement, which seems to have spread throughout the land and to other parts of the world, also is responsible for this condition, or to what extent it has rendered service in the matter will probably never be known. Yet, we all know that improvements of great importance have taken place, not only in our country, and Canada, but in other sections, as well.

Whatever the cause of the betterment might be, it is obvious that former, and somewhat destructive trade practices are no longer used by either buyer or seller.

The interest of the industry appears to be given first consideration by everybody concerned, and no efforts are spared to prevent a recurrence of situations similar to those which existed during some of the depression years.

The various cooperative trade associations and trade publications have, as usual, contributed in a great measure to the welfare of the pulp and affiliated industries. Swift changes of conditions last year necessitated utmost vigilance on their part to cope with arising problems. They carried on most efficiently, and are still doing a good job.

Two New Modern Mills

The two new mills, referred to earlier in this article as being completed, are the Weyerhaeuser Sulphite mill at Everett, Washington and the Union Bag Kraft mill at Savannah, Ga., and the revived mill on the Pacific Coast is owned and operated by the St. Regis Kraft Company, a subsidiary of the St. Regis Paper Company. During a recent interview with the president of the company, R. K. Ferguson, and C. B. Martin, vice-president and treasurer, it was disclosed that this mill has been equipped with a four-stage bleaching system of sufficient dimensions to bleach the entire production, should this be required. A new Karlstad drying machine, together with other up-to-date machinery, have also been installed. These are now operating, and are considered masterpieces in their respective groups. Being equipped with most modern machinery and efficiently managed, their production cost is reported as very low, considering the high quality manufactured.

This brings to mind the Ostrand Kraft mill at Sundsvall, Sweden, which, according to a Swedish newspaper, was built by the Swedish Pulp Company in 1931, was enlarged last year, and the annual output increased from 100,000 long tons to 135,000 long tons, or equivalent to about 150,000 short tons, making it the largest Kraft pulp mill in the world.

The inauguration of this enlargement was a gala event, attended by numerous distinguished guests, who were received at the mill by the chairman of the Swedish Pulp Company, Mr. Axel Wenner-Gren and Mr. Torsten Hernod, managing director of the company. Mr. Birger Sundfeldt, designer and manager of the mill, escorted the guests through the plant, all of whom were deeply impressed by the greatness and efficient operation of the mill. Later a banquet was held in the Sundsvall Town Hall, where speeches were made by Mr. Wenner-Gren, Mr. Hernod and others and, as we would say, "A good time was had by all."

Pulp Shortage Threatened

There has been no unfavorable signs on the horizon of the pulp world so far this year, except possibly a dim, but threatening sign of an expected shortage of pulp within the near future. Some trade observers feel that it cannot be avoided, and that we have never faced a more serious situation in this respect than the one now approaching.

During the World War, we were up against it for pulp but, despite this, I cannot recall that any paper or board mills were obliged to close down for lack of pulp, and I am inclined to believe that a way will again be found to pull us through somehow.

Snow Drifts and Zero Weather

Continued balmy weather in Canada and in several regions of the U. S. A. has slowed up the movement of pulpwood to an alarming degree and, while none of us is particularly keen for a lot of snowdrifts and zero weather, nevertheless, that's just what many are praying for and the rest of us will be glad to grin and bear it, if their prayers are answered.

If it does not turn cold soon, and the woodlands are not covered with sufficient snow to speed up wood operations, the chances are that there will be a shortage of pulpwood at some pulp mills.

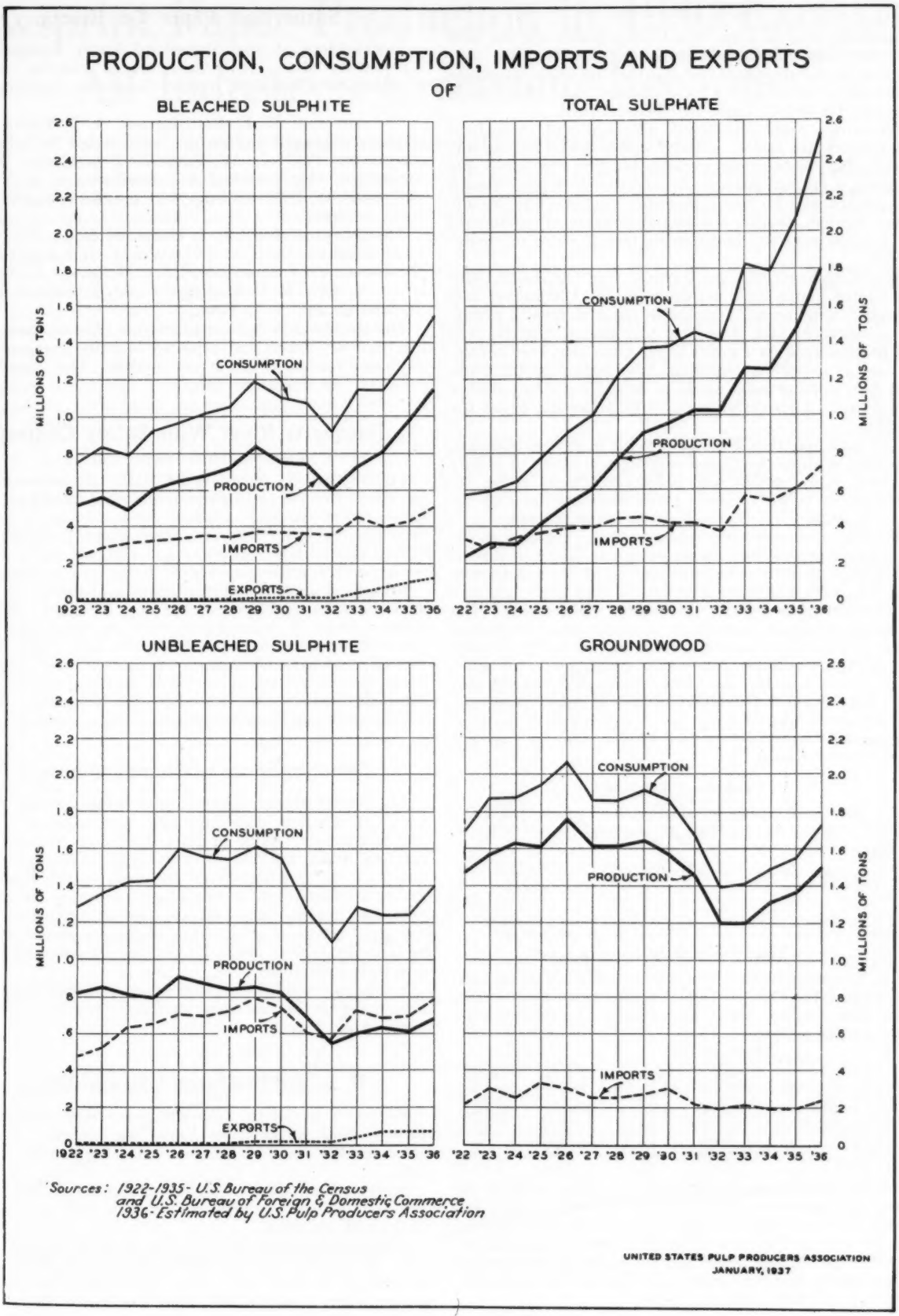
So far, the production of pulp has been climbing for several years past, and 1937 will not be an exception in this respect, if business in general continues on prevailing basis which it is expected to do by those in the know.

New Outlets for Pulp

New outlets for pulp have already been found, and more will be discovered. Not so very long ago, the tonnage used for artificial silk and later for Cellophane and other goods, outside of the paper industry, was rather unimportant but, today, approximately one million tons per year are required for the manufacture of these commodities and as this business is supposed to have carried the activity of 1936 into 1937, the prospects of further expansion in this field are very promising.

As far as Rayon and Cellophane are concerned, it can be stated, without much fear of contradiction, that there will be no slackening in demand for pulp from this quarter until these industries have reached a much higher level of production.

Barring international complications, the prospects for the current year are certainly more favorable than they were at the beginning of last year and as the demand for pulp has the earmarks of persistency, and apparently is without cause for interruption from any source, another upswing in prices within the not too distant future can be expected.


PRODUCTION, CONSUMPTION, IMPORTS AND EXPORTS
OF
BLEACHED SULPHITE
TOTAL SULPHATE
UNBLEACHED SULPHITE
GROUNDWOOD
MILLIONS OF TONS
CONSUMPTION
PRODUCTION
IMPORTS
EXPORTS
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
.2
0
1922 '23 '24 '25 '26 '27 '28 '29 '30 '31 '32 '33 '34 '35 '36
Sources: 1922-1935 - U.S. Bureau of the Census
and U.S. Bureau of Foreign & Domestic Commerce
1936 - Estimated by U.S. Pulp Producers Association
UNITED STATES PULP PRODUCERS ASSOCIATION
JANUARY, 1937

U. S. Leads Field

Running true to form, the United States led the field in production, with Canada second and Sweden third. According to reports, about one third of the world's tonnage was made here last year. As customary, the United States was also the largest buyer of Chemical pulp.

Numerous paper and board mills scattered throughout the country are still to a large extent dependent on imported pulp for their requirements but this situation is undergoing a gradual change. Should prices on pulp remain at present levels for any appreciable length of time, or advance further, another substantial increase in production on this continent will undoubtedly take place before many moons.

In reality, there is no good reason why Canada and also the United States could not produce both Unbleached and Bleached Sulphite on a profitable basis at today's prices. As a matter of fact, it is hard to conceive that this will not be attempted on a much larger scale than ever before, as soon as prevailing conditions have convinced the trade that new sulphite mills would at least have a fair chance of survival. They certainly ought to, at present prices for Sulphite.

The tariff question, like the bugaboo of over-production, is always with us, and some proposals in favor of a duty on wood pulp, together with added restrictions on the importation of pulpwood were given some attention by interested parties, but that's about as far as it went.

Because of weekly quotations of prices appearing in various trade papers, there is no particular object in repeating them at this time, but it might be of interest to note that the average advance from low to high levels last year on Chemical pulp appears to be about 22 per cent. The reported combined production in short tons of air-dry fiber, in accordance with figures compiled by the United States Pulp Producers Association of all grades of wood pulp manufactured in the United States is 5,143,092 tons for 1936, of which 1,496,000 tons are Ground Wood, and the balance, Chemical Pulp, and compared with the total tonnage of 4,418,316 tons for 1935, the increase of last year is 724,776 tons.

Canadian Production

The estimated yearly production of Canada for 1936, compared with the reported production for 1935, is as follows:

	1936, Tons	1935, Tons
Ground Wood	2,900,000	2,504,595
Sulphite	1,141,000	1,018,437
Kraft	265,000	236,536
Total	4,306,000	3,759,568

or an increase in production in 1936 of 14½ per cent over 1935.

Total Wood Pulp Imports

The total imports of wood pulp in tons of 2,000 lbs., air-dry weight, for 1936 and 1935, according to figures compiled from United States Department of Commerce reports, are, as follows:

	1936		1935	
	Tons	Value	Tons	Value
Chemical Pulp (Total)	2,050,051	$78,839,776	1,743,602	$67,483,566
Unbleached Sulphite	786,720	26,778,644	693,026	24,026,390
Bleached Sulphite	512,168	25,824,769	429,424	21,934,154
Unbleached Sulphate	635,722	19,771,988	526,684	15,893,593
Bleached Sulphate	102,375	5,844,031	84,658	5,193,789
Soda Pulp	12,737	565,572	9,416	40,636
Other Pulp	329	54,772	394	26,020
Ground Wood	227,778	4,051,224	190,041	3,277,385

Twelve months ago, reference was proudly made to the streamline appearance of the price structure which had existed for some time and also to the advisability of keeping our feet on the ground, but this contour changed last year until it is now more like the climbing vine and, as Major Bowes would probably say, "Up and Up it goes and, where it will stop, Nobody knows."

Sutherland Paper Co. Elects

Stockholders of the Sutherland Paper Company of Kalamazoo, Mich., held their annual meeting in the Chamber of Commerce rooms, Commerce Building, recently.

The names of R. E. Rutledge and A. J. Young were added to the board of directors, who elected the following officers for 1937: L. W. Sutherland, president; F. W. Sutherland, vice president and secretary; A. J. Young, vice president; R. E. Rutledge, vice president; and William Race, treasurer.

The board of directors is composed of E. W. Chase, L. M. Crockett, Dr. L. H. S. DeWitt, F. B. Eilers, Charles H. Farrell, W. J. Lawrence, E. A. McQuade, O. F. Miller, W. L. Otis, R. E. Rutledge, F. W. Sutherland, L. W. Sutherland, and A. J. Young.

The stockholders transacted routine business, and President L. W. Sutherland reported that the company had enjoyed a fairly successful year in 1936. The outlook was favorable, he said, for 1937.

Racquette River Wins Safety Contest

[FROM OUR REGULAR CORRESPONDENT]

POTSDAM, N. Y., February 22, 1937.—Announcement is made here that the prize given by the Associated Industries in the recent statewide accident prevention campaign has been awarded to the Racquette River Paper Company. The contest started last September and was concluded in December with fourteen paper mills in this state participating.

Records show that the local company worked 217,964.5 man hours and had but two lost time accidents. The accidents caused the injured persons to lose only eighty man hours or equal to one man losing ten days. The record was cited as unusual because the contest was conducted when new men were being taken into the industry and many old workers were returning after being idle. Credit for the record is given by officials to the employees.

Westinghouse to Change Quarters

The Westinghouse Electric and Manufacturing Company will move its Pittsburgh office and some of its general offices now located at East Pittsburgh to the Union National Bank Building in Pittsburgh. Occupying nine floors of the building, from the fifth to the thirteenth floors, the Pittsburgh district office, subsidiary district offices and headquarters offices including executive, legal, industrial relations, sales and accounting departments, will be centrally located in the Union Bank Building to facilitate their operations.

Formerly the company's district office and subsidiary offices had been in this same building. The move will be made about May 1.

F. L. Smith Opens Chicago Office

Frederick L. Smith, pulp and paper mill engineer, 21 East Fortieth street, New York, has opened a Chicago office at 208 North Laramie avenue. Telephone Austin 0360.

Miss Kathleen Carey, daughter of James L. Carey, paper mill architect and engineer, who died in 1935, is in charge of the Chicago office.

This announcement should prove to be of especial interest to Mr. Carey's former clients who are considering improvements in their mills. Miss Carey has at her disposal all her father's records which she has kept intact.

Newsprint Paper Production in 1936 Exceeds All Industry's Preceding Records

By C. L. Sibley, Regular Correspondent of the PAPER TRADE JOURNAL

Five years ago the head of one of the biggest newsprint organizations in Canada told your correspondent that the Canadian newsprint industry was so over-developed that newsprint consumption would not overtake the then existing newsprint production capacity for thirty years. Today every newsprint unit in Canada which can be operated on an efficient basis, without costly replacements and renovations requiring new capital, is working to capacity, and is well booked up with contracts and orders for months ahead.

Production is much in excess of any previous period in the history of the industry. The price trend is upward, and the market is rapidly developing symptoms of being a sellers' market, after being for seven lean years a buyers' market. Sound financial reorganizations are about completed of all the pulp and paper companies, big and small, practically all of which had been for years in bankruptcy.

Newsprint securities, which a year or two ago could be picked up for a song, are now quoted at substantial prices on the Stock Exchange, and during the past year not a few fortunes have been made by those who were far-sighted enough to pick up these securities when the picking was good.

Such is the picture, astonishing even to the operators themselves, which the newsprint industry offers at the opening of 1937, and there is every prospect that when the year ends it will have seen the industry firmly established on a sound financial basis and earning for its owners a reasonable profit. Today there is no longer among them a mad scramble for newsprint buyers. Instead there is a scramble among buyers for newsprint.

It is only with difficulty that the mills are keeping up with orders. On more than one occasion lately, right here in Montreal, newspaper publishers have had to borrow newsprint from one another to keep up publication, and paper manufactured in mills 100 miles away has been loaded on to trucks straight from the machines and rushed

NEWS PRINT PRODUCTION 1913-1936
UNITED STATES — CANADA — NEWFOUNDLAND
THOUSAND TONS
THOUSAND TONS
CANADA
UNITED STATES
NEWFOUNDLAND
1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936

Courtesy News Print Service Bureau

during the night to Montreal newspapers for use in printing the next afternoon, there being less than 24 hours between the time when pulp was manufactured into paper and the appearance on the streets of newspapers manufactured from that paper.

Not only are the prospects of a continuance of the present demand bright, but there is every prospect that it will see a large increase during the year. This view is supported by representatives of newspaper machinery manufacturers who have been visiting Montreal lately. They state that they are almost overwhelmed by orders for new machinery, and that an enormous increase in color printing machinery and consequently in newspaper output is developing.

As an instance of how increasing output of newspapers is waiting on improved equipment, the representative of one firm of newspaper machinery manufacturers told your correspondent that whereas during the depression they had but four machinists in their shops, they had in these same shops at the present time no fewer than 900 employees.

Outlook Bright for Industry

No manufacturing industry in Canada had such disastrous experiences during the depression as the newsprint manufacturing industry, for the industry went bankrupt on a wholesale scale. Most companies operated for years in bankruptcy while one plan after another was hatched to effect financial reorganization. Today only the finishing touches remain to be put to the financial rehabilitation of the last of the bankrupt companies, and there is no manufacturing industry in Canada with future prospects so bright. No wonder American consumers of newsprint are taking measures to ensure supplies.

Despite the fact that this year has seen an increase of $1.50 per ton in price put into effect—an advance that a couple of years ago no publisher would accept—there are publishers who today would be willing to pay even more for current needs if they could be assured of the same advanced price prevailing for 1938. It is said that in one case at least an offer by a large publisher of a substantial advance, to take effect immediately, and to prevail for 1938, has been refused.

All this, of course, is good news not only for newsprint operators, but also for all those industries which specialize in the equipment of newsprint manufacturing mills. They have had a lean time during the past seven years, but they are now coming into their own. There can be no doubt that with the financial rehabilitation of the various newsprint companies, and with operations on a profitable basis once more in sight, a tremendous business will develop in the renovation of mills, the replacement of obsolete equipment, and the supply of new machinery.

The difficulties in regard to capital requirements with which companies have been faced will disappear as newsprint production once more becomes profitable, for capacity can quickly become enlarged with the expenditure of capital on plant, much work in this direction is already being done, and much more will follow.

Ups and Downs of the Industry

It is interesting to review the industry since the United States lifted the tariff on newsprint imports in 1911. That was when the expansion of the Canadian newsprint manufacturing industry began. The war stopped the expansion for a time, but between 1919 and 1930 no fewer than 91 newsprint machines were installed in this country, adding 8,360 tons daily to the manufacturing capacity, or an increase of 216,000 tons a year.

By 1930, however, the great depression had begun, yet in the next two years 12 more machines were installed, adding another 1700 tons to the daily capacity of the industry. That was the last straw, for consumption had fallen even more rapidly than capacity had increased. There was a mad scramble for markets, cut-throat competition, and bankruptcy for practically every newsprint manufacturing company in the country. Out of that debacle the industry has just emerged. The following figures, showing how production has varied in recent years, and the basis on which production is now operating, will be interesting.

Record Production

While the production of newsprint in Canada in 1935 surpassed all previous records in the history of the industry, that in 1936, at 3,190,599 tons, surpassed the 1935 record by no less than 15.9 per cent. Production kept up consistently throughout the year, the month in which the highest total was recorded being October, when 301,106 tons were produced. The figures for each month, as compared with the similar month for the previous year, are as follows:

	1936	1935
January	227,955	201,959
February	221,569	180,305
March	243,900	205,682
April	258,721	222,224
May	267,067	242,693
June	270,051	232,020
July	274,627	234,266
August	270,053	235,573
September	269,782	223,892
October	301,106	266,515
November	285,771	262,854
December	289,312	244,732

Comparisons of production with previous years, before and after the depression, supply an interesting chart of the growth of the industry. They are as follows:

	Tons		Tons
1924	1,350,000	1931	2,221,500
1925	1,522,200	1932	1,907,600
1926	1,881,700	1933	2,017,000
1927	2,086,900	1934	2,599,292
1028	2,381,100	1935	2,753,289
1929	2,728,800	1936	3,190,599
1930	2,500,000		

Extraordinary Fluctuations in Price

The picture is not complete without comparable figures in relation to the price of newsprint. As has been stated, the present year opened with the contract price level at $42.50 per ton, f.o.b. New York and Chicago, representing an increase of $1.50 per ton over last year's rate. The mill price works out at $36.50.

It may be noted that so far as Texas is concerned an increase of $2.80 per ton over the 1936 price has been announced by the Powell River Company in British Columbia. The Pacific Coast mills are not a party to the Newsprint Institute agreements in the East, and it is thought that perhaps the mills on the coast have found it expedient to quote a zone price which involves their absorbing a higher freight rate than is warranted by present conditions.

The trend of the average contract price per ton, f.o.b. mill Three Rivers, over the past twenty odd years has been as follows:

1913	$40.00	1926	65.00
1914	40.00	1927	65.00
1915	38.00	1928	60.70
1916	48.00	1929	55.20
1917	60.00	1930	55.20
1918	60.00	1931	50.20
1919	74.00	1932	41.13
1920	105.00	1933	34.05
1921	103.75	1934	33.20
1922	70.00	1935	33.20
1923	75.00	1936	34.20
1924	74.00	1937	36.50
1925	70.00		

Huge New Mill Being Built

While a number of improvements making for greater productive capacity have been carried out at various pulp and paper mills, the only major operation in this connection has been the starting of the construction of a new newsprint mill for the Ontario Paper Company's owners, the *Chicago Tribune* and its affiliated newspaper the *New York Daily News*.

This mill is situated at Comeau Bay, at the mouth of the Manicouagan River, on the Lower St. Lawrence, some 750 miles below Quebec, on the north shore. The initial expenditure on the construction of this mill, which includes a pulp and newsprint plant, and a 60,000 h.p. hydro-electric development, is put at $12,000,000, but the complete scheme, as envisaged, will entail, it is said, an ultimate expenditure of between $25,000,000 and $30,000,000.

Work on this development has been going ahead on a tremendous scale ever since the spring, for it is a complex project, entailing not only the construction of a mill and water power, but also the construction of a modern town, with all modern conveniences in what was previously an uninhabited wilderness remote from civilization.

Simultaneously with the work of actual construction orders were placed with Dominion Engineering, Ltd., of Montreal, for the construction of two newsprint machines, the contract, it is said, entailing a matter of over $2,000,000. The machines are to be of the 262-inch type, and will embody all the most modern improvements. They will be capable of production speeds of 1,500 feet per minute.

While they will not be the widest machines in the world, only two, one in Canada, and one in England, exceed them in average trim. Some of the features of the new machines have hitherto been used only in the production of fine papers. This is being done so as to make possible the manufacture of the highest grade newsprint at much higher speeds than are now common in the newsprint industry.

Work has proceeded on the manufacture of these machines since last May, and simultaneously orders for all the complementary equipment has been placed with other manufacturers, with the object of bringing the mill into operation at the earliest possible moment. Freighters owned by the company will carry newsprint direct by water to New York and Chicago.

Not a Competitive Mill

The president of the Ontario Paper Company, A. A. Schmon, has explained that the Comeau Bay mill will remain completely apart from the general picture of the newsprint industry in Canada. It will not be a competitive mill as it will serve only its owner newspapers, and purchases of these newspapers in Quebec Province will not be materially affected by the construction of this new plant.

"It should be borne in mind," continued Mr. Schmon, "that the newsprint ultimately to be manufactured by the Manicouagan mill at Comeau Bay in place of the newsprint now being purchased by the *New York Daily News* will not materially affect the sales of existing mills in Quebec. During the past ten years an insignificant proportion of the newsprint purchases of the *News* has been manufactured in Quebec, the major portion of this tonnage coming from mills in the United States and Newfoundland.

"Of even greater interest and importance is the fact that the *Chicago Tribune* and the *New York Daily News* together will consume in 1938, when the Manicouagan mill goes into operation, approximately 350,000 tons of newsprint per year. The Ontario Paper Company, at its Thorold mill, produces only 150,000 tons yearly. The production at Comeau Bay will be 100,000 tons per annum. Which means that the two affiliated newspapers will continue to purchase approximately 100,000 tons per year from other newsprint companies, a total approximating their outside purchases at the present time.

"The steady increase in newsprint consumption by these two newspapers means, in effect, that even with the greater Quebec production as a result of the Comeau Bay development, other existing mills located in Quebec and elsewhere will be selling no less newsprint to these newspapers than they are selling at the present time."

Outlook Changes with Political Overthrow

Meanwhile it is interesting to note that during the past year there has been a complete political overthrow in the Province of Quebec. The Liberal party, which had been in power for over thirty years, has been thrown out of office and a Nationalist party, of which Maurice Duplessis, of Three Rivers, is the head, has taken over the reins of power.

The new Premier and his Government have put into force regulations for the increase of pay to men engaged in woods operations, and this, of course, has increased the cost of production of newsprint. He has also made the somewhat sensational announcement that the Government will not allow any new pulp and paper mills to be established in the Province until all the old ones are operating. The mills not in operation to which he particularly referred is the one at Chandler, which has capacity for the production of 30,000 lbs. of strong sulphite fibre per day; the mill at Ste. Anne de Beaupre, which has a sulphite plant, a ground wood plant and two 234-inch Fourdriniers for the manufacture of newsprint; and a mill at Cap Madelaine, which has a ground wood and sulphite plant and a newsprint capacity of 520,000 lbs. of newsprint per day.

Another sensational announcement that followed was that the Quebec Legislative Council has passed a bill to permit the Lieutenant-Governor-in-Council, which means the Government, to authorize expropriation of the mill at Chandler, now owned by the Premier Pulp and Paper Corporation, if it is not put into operation. It is stated that the Government, after taking over the property, has a purchaser ready to buy and operate it.

In Montreal it is questioned whether the mill can be commercially operated, it being pointed out that it is significant of some inherent difficulty in operation that the mill and property originally cost $15,000,000 and that the latest purchasers paid only $85,000 for it, then forthwith closed the mill.

A Joint Ontario-Quebec Policy

Another significant development during the year—and one which is regarded by the newsprint industry as distinctly encouraging—is the fact that in the last month or two there have been two conferences between the Government of Quebec and Ontario with a view to co-ordination of the forestry development policies of the two governments. The second of these conferences was preceded by a round-table meeting between the Quebec Government and representatives of employers and employees of this provinces's forests and of the pulp and paper industry.

The conferences resulted in a general agreement being arrived at between the two governments respecting conditions which in the past have resulted in such competition in pulp and paper products as to keep prices on an unremunerative basis. Agreement was arrived at also for common action in respect to forest conservation, the judicious exploitation of forest resources, stumpage fees, wages of lumberjacks, etc.

Canada's Most Important Manufacturing Industry

The pulp and paper industry has easily maintained its

position as the most important manufacturing industry in Canada, heading the lists for gross value of manufactured products as well as for total number of employees and distribution of wages and salaries. In total capital invested the industry is second only to electric light and power plants.

The gross value of production, considering only the manufacturing stages, and not counting the products of the operations in the woods, which form such an important part of the industry as a whole, amounted last year to around $175,000,000. This was still much below the peak year as regards value, for in 1929 the gross production amounted to $243,970,761.

This gross value represents the sum of the values of pulp made for sale, pulp made for export and paper manufactured. It does not include pulpwood nor the pulp made in combined pulp and paper mills for their own use in making paper.

With regard to the net value of production, the pulp and paper industry is second only to central electric stations, heading the list of purely manufacturing industries since 1920, when it replaced sawmills. The net value of production last year was around $85,000,000, as compared with $121,739,922 in 1929.

When 1936 opened there had for a year been no change in the number of operating pulp and paper mills. There were 95 mills in operation. Minor changes, however, had occurred in the individual provinces. The closing down of one pulp mill in Ontario was offset by the reopening of a pulp and paper mill in Manitoba. Of the mills in operation 71 were manufacturing pulp and 67 making paper.

Newsprint paper makes up nearly 85 per cent of the total reported tonnage of paper manufactured in Canada. It is estimated that the total gross value of newsprint manufactured last year was around $110,000,000, as compared with $91,762,201 in 1935. This latter was 39.2 per cent below the value of that produced in 1929.

The total value invested in the manufacturing part of the pulp and paper industry at the beginning of the year was $545,572,938, only the capital invested in operating mills being included in this amount.

The total employment on salaries and wages in pulp and paper mills in 1936 has not yet been compiled, but in 1935 it was 27,836, and the total payroll was $35,893,313, as compared with 26,993 in 1934, with salaries and wages amounting to $33,307,043.

Canada's exports of newsprint, by far the largest part of which go to the United States, are second now only to her exports of wheat and are greater than the newsprint exports of the rest of the world. The gross contribution of the pulp and paper industry towards Canada's favorable balance of trade is substantial, and may be judged from the fact that in 1935 this contribution amounted to $122,235,500.

Value of Exports in 1936

There was an increase of no less than $23,450,941 in the value of Canada's exports of pulp and paper in the calendar year 1936, as compared with the value in 1935. Of this amount, $15,715,383 represented the increase in the value of newsprint exports and $3,631,284 the increase in the value of pulp exports. The remainder was represented by miscellaneous paper exports.

The total value of pulp, paper and manufactures of paper exported in 1936 was $145,108,442, as compared with $121,657,501 in 1935. Exports of newsprint increased in value from $87,924,251 in 1935 to $103,639,634 in 1936, and exports of pulp increased in value from $27,615,730 in 1935 to $31,247,014 in 1936. The quantity and value of newsprint exports for 1936 for each month in the year were as follows:

	Cwt.	Value
January	3,697,675	$6,326,653
February	3,681,579	6,267,605
March	5,131,272	8,794,454
April	3,857,876	6,653,093
May	5,165,763	8,907,498
June	5,671,779	9,816,644
July	4,680,980	8,046,237
August	5,151,538	8,890,078
September	5,567,360	9,755,549
October	5,614,653	9,891,609
November	5,916,653	10,340,246
December	5,724,659	9,949,968

While the vast bulk of these exports went to the United States, substantial amounts went to other countries, notably to the Antipodes and to South America. Newsprint was exported to over 30 countries, the more important customers outside the United States being Australia, New Zealand, British South Africa, the United Kingdom, the Irish Free State, Argentina, Chile, Cuba, Japan, China, British India, Brazil, Peru, Uruguay, the Philippines, Hawaii, Mexico, and Venezuela.

Forest Conservation

The Department of the Interior, in a report recently issued, states that the work of compiling the national forest inventory has brought out some interesting facts. Inventory figures indicate that the total forest area amounts to 1,254,082 square miles, of which over one-third is non-productive, the remainder being almost equally divided between merchantable forests and young growth (approximately 400,000 square miles of each).

The forests are estimated to contain 273,657,000,000 cubic feet of timber, of which 62.5 per cent is accessible under present conditions. Of the accessible timber nearly 80 per cent is coniferous (softwood). The value of this accessible timber is estimated at $2,175,000,000.

The Dominion Forest Service, in co-operation with the Woodlands Section of the Canadian Pulp and Paper Association, is undertaking a study of the possibility of applying silvi-cultural methods to commercial operations. In this connection the application of aerial photography to forest estimating has proved of the greatest value.

Canada, the report states, probably leads the world in the application of aerial photography to forest mapping. Something like 110,000 square miles of forests have been mapped by the Dominion Government, in addition to which various provincial governments have mapped the forests on about 50,000 square miles.

Much work is being done in reducing fire hazards and in experimental work for the control of white-pine blister. This rust passes part of its life on the leaves of wild gooseberry and wild currant plants. It had been found that if all these wild bushes growing within 300 yards of pines were uprooted and destroyed, the pines so protected were thereafter safe from rust infection from them.

On the other hand, the spores from the domestic black currant are so virile as to have an active infection distance of one mile, so that this most common currant of the gardens constitutes a menace to the white pines in its neighborhood. Almost without exception, from whatever points this rust was reported in its initial invasion of Canada, it was first found on a black-currant bush.

Forest Products Laboratories

There were increased demands in the year under review for the services which the Forest Products Laboratories afford to the industrial life of the Dominion. The investigations into the problems of the manufacture of pulp and paper were carried on by the Pulp and Paper Division at Montreal, the activities being directed along lines likely to furnish fundamental knowledge applicable to the manufacture of pulp and paper.

Paper Convention In New York Well Attended

American Paper & Pulp Association Holds Sixtieth Annual Meeting In the Waldorf-Astoria — Affiliated Organizations Also Hold Successful Meetings and Discuss Many Topics of Important and Timely Interest to Industry.

The Sixtieth Annual Meeting of the American Paper and Pulp Association and affiliated organizations, which opened at the Waldorf-Astoria, New York, last Monday and continued the better part of the week, attracted a satisfactory attendance.

Election of Officers

The following officers were elected by the Board of Governors to serve during the ensuing term:

President, D. C. Everest, Marathon Paper Mills Company, Rothschild, Wis.

Vice-President, Frank J. Sensenbrenner, Kimberly-Clark Corporation, Neenah, Wis.

Vice-President, Hugh J. Chisholm, Oxford Paper Company, New York.

Vice-President, Stuart B. Copeland, Northwest Paper Company, Cloquet, Minn.

Vice-President, Richard J. Cullen, International Paper Company, New York.

Vice-President, A. C. Goodyear, Bogalusa Paper Company, Bogalusa, La.

Vice-President, H. L. Jenkins, George O. Jenkins Company, Bridgewater, Mass.

Vice-President, John R. Miller, West Virginia Pulp and Paper Company, New York.

Vice-President, John L. Riegel, Riegel Paper Corporation, New York.

Vice-President, S. L. Willson, American Writing Paper Company, Holyoke, Mass.

Vice-President, Norman W. Wilson, Hammermill Paper Company, Erie, Pennsylvania.

Vice-President, J. D. Zellerbach, Crown Willamette Paper Company, San Francisco, Cal.

Vice-President, Z. W. Ranck, Crystal Tissue Company, Middletown, Ohio.

Executive Secretary, Charles W. Boyce, 122 East 42nd street, New York.

Retiring President's Address

An open meeting was held on Thursday afternoon, presided over by F. J. Sensenbrenner, the retiring president of the association, who discussed "The Recovery and Its Problems In the Paper and Pulp Industry." He said:

"American industry has at last responded to the influences of economic revival. A broad period of prosperity seems to lie ahead. The opportunity for the paper and pulp industry to share fully in this prosperity seems clearly defined.

"Last year the consumption of paper in the United States arose to a record level. It required a greater production than ever before in the history of the industry. Late in the year the prices of most grades responded to the greater demand. In 1936 the industry achieved a large measure of recovery.

"The changes that have taken place since 1932, the bottom of the depression, are impressive. For instance, paper production has increased 46 per cent compared with the low; average mill realization on all grades of paper, including paperboard has risen 17 per cent; employment has increased 26 per cent; hourly wages rates exceed all former marks and the periodic earnings of our workers are steadily increasing." These are all important steps in the recovery process. There are others, however, that must yet be taken before recovery is complete. Important among these is the reconstruction of the industry's resources and the restoration of its earnings.

"During the depression most companies heavily curtailed their improvement programs resulting in a serious deterioration of the industry's production facilities. Although many improvements have been made in the past eighteen months, there is still much to be accomplished.

DR. CLARK EVEREST, the New President

"The industry's earnings have not yet reached the levels that are essential to continued welfare, although they have shown some improvement. It is reasonable to expect, however, that the high consumption rate will eventually, if not speedily, take care of this situation.

STEPS IN RECOVERY

"The order with which the steps in recovery occurred is particularly significant. Excepting the flurry in sales in 1933 that halted downward price tendencies and in some grades resulted in price increases, the industry first increased its employment and its wage rates when it adopted its code of fair competition. Throughout a period of nearly eighteen months thereafter these increases

were sustained despite operating rates that at times sank below 60 per cent of capacity.

"Prices which were in many cases close to or below the cost line did not respond until near the end of the third year of recovery. In the meantime, the industry was forced to draw from its reserves to finance not only its greater labor costs, but also the improvement of its properties. Rebuilding of resources and restoration of earnings were not generally possible until prices began to move upward.

Recovery Program Depended Upon Cooperation

"This order, largely dictated by the provisions of the National Industrial Recovery Act, was exceedingly difficult to maintain. In this vast experiment in managed economy many economic laws were given little thought or were completely disregarded. Fixed arbitrary standards could be maintained only because the will to maintain them existed and because the members of the industry strove honestly and whole-heartedly to control the elements that create downward pressures in order that it might assist in the recovery program.

"For instance, restriction of working hours and the establishment of minimum wage rates greatly increased labor costs at a period when neither production nor prices permitted equal increase in income. In fact production was at the level during most of this period that under other circumstances would never have permitted such restrictions. Yet, the industry avoided epidemics of wage cutting, reduction in employment, and destructive marketing. This measures the effectiveness of group action when the individual will to achieve a common goal is firmly fixed.

Code Regulation

"Opinion in respect to the NRA varies widely. In our thinking of that period it is important that we clearly distinguish between the Act and its administration. Industry quite generally seems to view with favor the business principles laid down in the National Industrial Recovery Act itself.

"In common with all others, the paper and pulp industry had difficulties in code administration. Even though these difficulties constituted a tremendous handicap, the administrative agencies of the industry itself had by the end of the NRA period reached a high degree of real efficiency.

"When the compliance provisions of the NRA failed to meet the promises of the Act, the industry and its administrative agencies refused to confess failure because forsooth there could be no dependence upon a governmental police force. This attitude prepared the industry to carry on after the Supreme Court's decision in the Schechter case.

"The industry was fortunate at the beginning of the code period in being able to establish a sound integrated organization structure. It was particularly fortunate—and upon this our measure of success in code administration largely depended—upon having men who were willing to give their time to the solution of industry problems. To these men I shall always feel grateful, they deserve the highest respect of the industry.

"In looking forward into the future we cannot fail to recognize the proven value of organization work and the habits of cooperation that have grown from this work. We must preserve these assets.

Paper Consumption is Increasing

"The immediate business prospects appear exceptionally bright. The recent reaction of prices to the rising demand gives assurance that increased costs of manufacture will be covered and that the industry once again has the opportunity to attain a position of reasonable operating profit. The consumption of paper gives no evidence at this time of slackening its rate of increase, despite the fact that eventually, slowing up is inevitable.

"Business uncertainties—the general labor situation that may become extremely difficult before the year is over, even the hints of war and the possibilities, if not actual probabilities, of the enactment of regulatory legislation of one kind or another—all these and perhaps many other influences may have far-reaching effects upon business. Even so it is doubtful if the combined influences will substantially lessen paper consumption in the immediate future. In this there is assurance of good business,—providing capacity does not increase too rapidly.

Industry Expansion

"No one can observe the rapid expansion in the South without recalling recent experiences in Canada. New mills now planned, in addition to the increase in existing capacity through improvements, amount to a substantial tonnage. An increase of well over ten per cent is already in sight. If the consumption trend maintains its present rate of growth, we can absorb some, even substantial increase, in tonnage capacity. But whether or not all that is now projected will find immediate profitable outlet is indeed problematical.

"Moreover, it is likely that capital will continue to flow into the industry. A current as strong as that which has already brought nearly $100,000,000 of new investment into the industry is not apt to stop suddenly of its own accord. To many, the industry appears to be moving irresistibly toward a catastrophe similar to that which occurred in the newsprint industry within the last ten years.

Apparent Shortage of Wood Pulp

"A contributing factor to the expansion wave is an apparent world-wide shortage of wood pulp. Although no estimates agree, it is probable that a million tons of wood pulp will be used in the world this year for purposes *other than for paper manufacture.* This demand added to the rapidly-growing requirements for paper manufacture has resulted in a complete reversal of the wood pulp situation. Since 1921 the supply seemed to be greater than demand and world prices broke down. Today the demand exceeds the supply and spot prices have jumped upward perhaps as much as fifty per cent, and this is bound to affect contract prices sooner or later. Paper prices already reflect these influences.

"Although the costs of manufacturing pulp have undoubtedly increased in every pulp producing country, they certainly have not increased as rapidly as have pulp prices. As a matter of fact, the price of pulpwood has not moved yet substantially above the depression levels in many important pulp producing countries. The current situation is, therefore, not a true reflection of increased costs; it is the reflection of a demand that has finally caught up with and now exceeds the supply, apparently in substantial amount. Obviously, unless manufacturing costs increase proportionately, the price structure can topple if either demand suddenly slackens or supplies increase. This is not an entirely healthy situation.

"No one will deny that high product prices and low raw material costs constitute a powerful attraction to capital. It is likely to lead to over-expansion and consequent reaction. It is this possibility that creates apprehension in the industry.

"If the theory that economic action is followed by reaction in essentially the same degree is sound, the current market situation must be our immediate concern. It is my belief that the welfare of our industry for a considerable period in the future depends upon what takes place in 1937. Wisdom and foresight as an essential in handling

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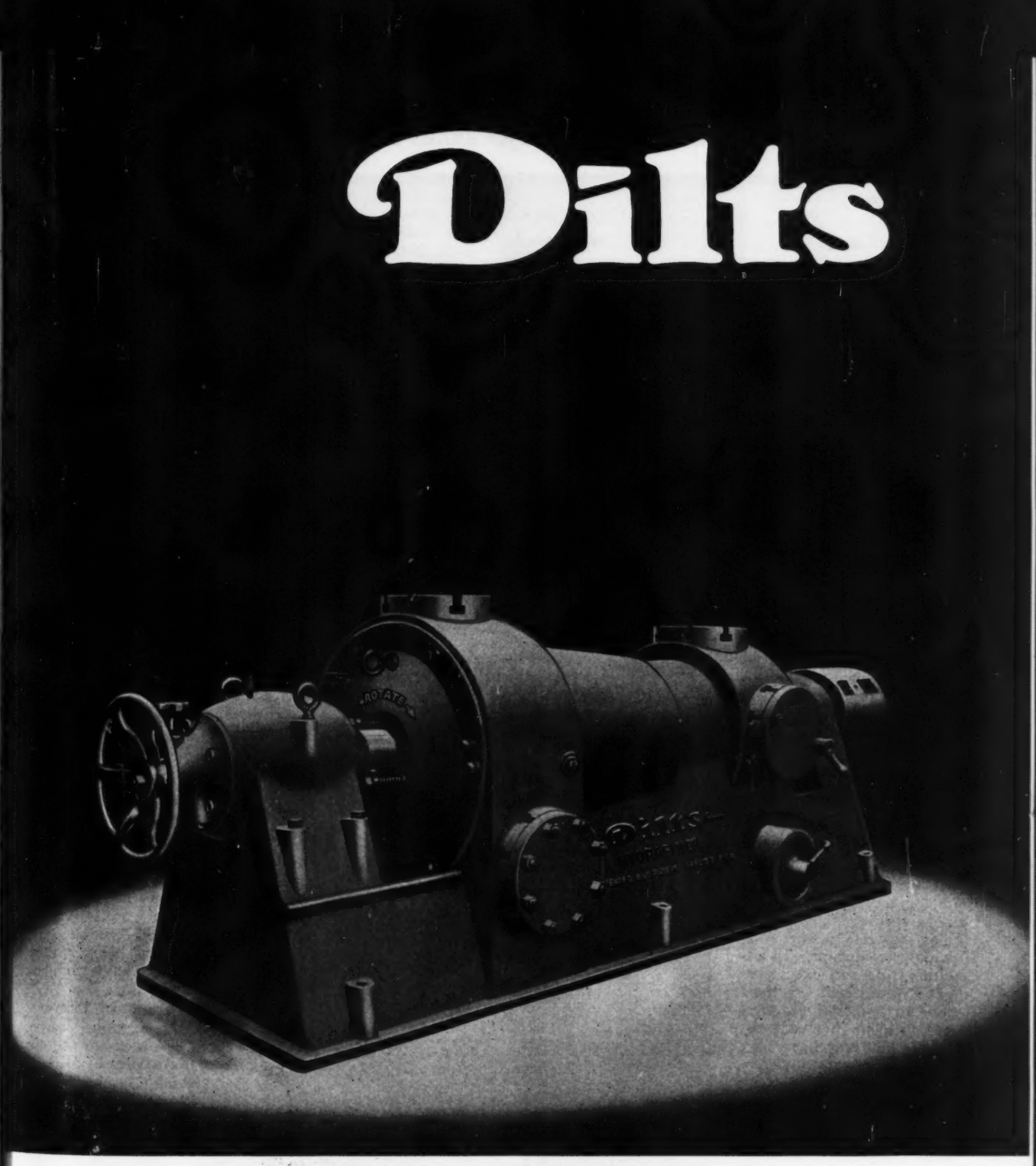

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ADVANCE OF TECHNICAL KNOWLEDGE

"We also know that the advance of technical knowledge is not integrated with the swings of the economic pendulum. Spurred on by the incessant urge for lower costs, research is rapidly revolutionizing our industry and the demand for men who have acquired through academic training ability to conduct investigative research projects and to put the results of such projects into practice, is greater today than ever before.

"Recognizing this, a group of companies in 1929 joined together to establish a school for advance training of men for the industry and coincidentally an organization, adequately manned and equipped, for conducting research upon a much broader basis and at less cost than any one company could afford.

"In this way the Institute of Paper Chemistry began. Today the Institute has reached a position in both academic and research fields that is unequalled in American industry. The Institute, now supported by 60 companies, is a proud tribute to cooperative action.

"Its products, trained men and research results, can be depended upon to keep those who avail themselves of its resources, moving forward through the maze of changes and shifts, economic and technical, that experience indicates always awaits the manufacturer of paper and pulp. Moreover, the Institute is an asset to the whole industry, for its facilities are quite generally available at reasonable cost to assist in association projects.

FINANCING COOPERATIVE ACTIVITIES

"In closing, I wish to speak about financing our association. Back in 1934 when the industry's financial resources were severely depleted, our associations did not lack adequate financial support. Funds that undoubtedly added to the red figure of many companies were forthcoming without complaint. In addition, many executives gave unstintingly of their time to cooperative activities, which involved expenses that may have been as great in many cases as association dues. But today when the industry approaches a position of profitable operation, there is some complaint concerning association dues.

"A member of the Board of Governors at the annual meeting in 1934, pointed out that a time would undoubtedly come when company executives could no longer give to industry matters the attention that they were giving at that time. He added that in the meantime, the industry should see to it that association personnel were trained to handle many activities that were then being carried on by company executives. He stated further that when that time came the cost of association operation would increase insofar as dues were concerned, but that the total cost of cooperative work in the industry as a whole would be substantially reduced.

"That prophecy has come true. The time has come when the industry's demands upon company executives must be reduced. The personnel of our associations must accept greater responsibilities. The extent to which this may be done depends largely upon adequate financing. If our industry is to keep pace with other great American industries, if our interests are to be protected adequately in national legislation and economy, we must finance adequately the agencies through which we work."

CHARLES W. BOYCE, Secretary

Committee on Public Affairs Report

Norman W. Wilson, Chairman, presented the report of the Committee on Public Affairs, as follows:

"The origin, objects and accomplishments of your Committee on Public Affairs are so well known to you and to every mill in the Industry that it seems unnecessary for us to submit a long and detailed report at this time. The thought was expressed during the last Session of Congress that no doubt the work of the Committee in closely following proposed legislation which would affect Industry would perhaps fall off after the Session was concluded.

"The fact is, however, that the reverse proved to be true. The passage by the 74th Congress of several vitally important Statutes, among which may be enumerated the Robinson-Patman Act and the Walsh-Healey Act, made it necessary for the Committee to keep constantly in touch with developments and be continually on the alert to safeguard the interests of the manufacturers of paper.

"During the first few days of the First Session of the 75th Congress, something over 3,000 bills and resolutions were introduced, and at the time when this is being written that number has been more than doubled.

"We are aware that several organizations have standing orders to the effect that copies of all bills and resolutions introduced in either branch of The Congress be sent to them; that other organizations obtain copies of all so-called important bills, many of which, while affecting industry as a whole, do not relate specifically to the paper industry.

"Long ago the Committee adopted a policy which has been approved by the Executive Committee and by the Board of Governors that it would only concern itself with proposed or duly enacted Federal legislation which definitely and di-

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rectly affected the Paper Industry in contrast to general legislation such as Tax Bills, etc.

"All bills falling within this class come to us daily. We are also in receipt of daily releases from various departments. We are in touch with many other industries—we keep a constant check on important matters pending in Washington and are able at all times to take such steps as may be proper for the protection of this Industry.

"From time to time summaries of particularly important bills are sent out to the mills. Many of these summaries contain reference to bills dealing with raw materials, but we wish to assure you now, as we have done heretofore, that never at any time has this Committee or the Association concerned itself with legislation dealing with raw materials. The information relating to those bills is transmitted to the Industry for such action as the various individual mills may care to take. Recent conference with the authors of some of these bills indicates that there is no pressure for their immediate enactment.

"From the Committee on Stream Pollution Legislation you will receive a report covering its activities. The Committee on Public Affairs has worked with that Committee from its inception because we have realized that that legislation was something which definitely and vitally affected practically every mill in the Industry.

"We are continuing to do during this Session what we have heretofore done, that is, before seeking assistance from the mills with respect to any particular type of legislation, we have endeavored to ascertain whether or not the proposed bill had been merely thrown into the "hopper" or whether there was definite pressure back of it for its enactment.

"If you do not find in the bulletins or letters sent out from the association information which you may desire with respect to any bill or bills, if you will get in touch with the Association or with Counsel the information which you wish will be obtained and transmitted as speedily as possible. A number of the mills and several of the Divisional Associations avail themselves of this service, which we are pleased to render.

"In other words, if you learn, through the press or through Washington letters which you may receive from organizations functioning from that city, of the introduction and pendency of a bill in either branch of The Congress, and you wish definite information as to its status, please do not hesitate to get in touch with the Association, apprise the secretary of what you wish to know and if it is possible to obtain it the desired information will be forwarded to you quickly.

"We will not attempt to enumerate at this time the bills which we are following closely, nor will we now attempt to express our opinion as to what measures may or may not be passed. However, we do wish to point out the practical certainty that legislation definitely dealing with hours, wages, child labor and so-called Fair Trade Practices will be introduced and passed by this Congress; also that a definite and well organized effort will be made to revamp and reorganize the present Federal Trade Commission.

"It may be that this legislation will take the form of several bills. It may be that it will seek to take away from the Federal Trade Commission, as now constituted, some of the powers which it is exercising and to transfer in whole or in part to another body the power and the duty of effectuating such a legislative program as we have just referred to.

"There has been reintroduced at this Session a bill (S. 10 by Sen. O'Mahoney) which was pending at the close of the last Congress, providing for the Federal incorporation and licensing of corporations dealing in Interstate Commerce. Some hearings have already been had on this bill. It is our opinion that the fate of this type of legislation, as well as the fate of the so-called Thirty-Hour-Week bills will depend entirely upon what happens to the bills yet to be introduced which deal with hours and wages.

"These bills which will contain something comparable to N.I.R.A. and other bills dealing with the Agricultural problem must be carefully followed, and we are sure you will agree with us that it is well our Industry is organized to take a part in the deliberations and hearings which will be had with respect to them.

"Though we have repeatedly done so both orally and in writing, we desire again to bring to your attention the plain fact that the Committee cannot function in your behalf without your wholehearted cooperation and assistance, and that to enable you to render this it is of the utmost importance that you become personally acquainted with the Congressional Representatives from your respective Districts. We are repeatedly told that your Representatives appreciate your personal letters with respect to pending legislation and your factual presentations as to how such legislation will effect you.

"As the work of your Committee has progressed and developed we are more than ever impressed with the fact that there are Paper Mills in some thirty-seven States and that an industry such as ours, properly organized, can play a proper and important part with respect to legislation which affects it."

Import Committee Report

The annual report of the Import Committee of the American Paper Industry was presented by Chairman John R. Miller who spoke as follows:

"The Import Committee of the American Paper Industry devoted a large part of its time during 1936 to broad problems, such as the reciprocal trade agreements, without the slightest diminution of its efforts to check specific evasions of the tariff law.

"One direct result of the Import Committee's studies of the effects of the reciprocal trade agreements has been a decided change in Administration procedure. The committee participated actively in many conferences with other industries which have resulted in an abandonment of the so-called "star chamber" procedure which had been a chief target of opponents of the reciprocal trade agreement policy.

Future hearings will be prefaced by definite information to all industry as to what commodities will be considered in any proposed trade agreement. The paper industry, therefore, will know in advance whether any of its products are likely to be subjected to changes in rates of duty. Consequently, in future negotiations the committee will be able to prepare material for the paper industry with a definite knowledge of what grades, if any, are likely to be affected by any pending agreement.

"Under the previous practice it was necessary to proceed blindly in the preparation of material for hearings at Washington on all grades of paper involved in foreign commerce, and to devote much time to grades which might not be under consideration.

"The only agreement formally announced to be pending at the present time is one with Ecuador, but it is stated that there have been preliminary conferences looking toward a trade agreement with the United Kingdom.

"Another result of the Committee's activities in connection with reciprocal trade agreements was the decision of the State Department to permit producers to file complaints with a view to changes in trade agreements which are shown to be working undue hardship on any particular domestic industry. This procedure is already being fol-

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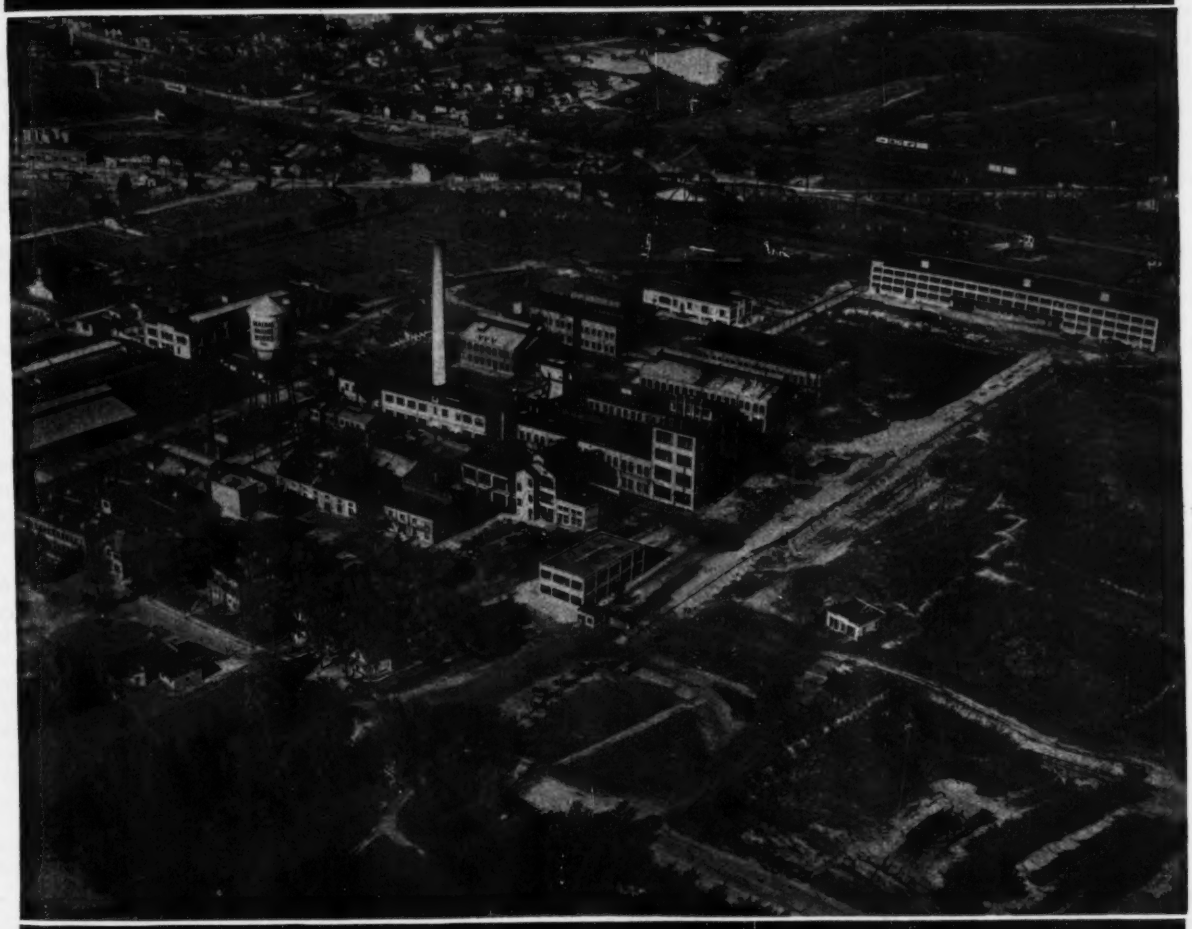

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lowed in a complaint against the effect of the depreciation of French currency on the international paper market. Whether this practice will have any practical effect remains to be seen, but at least a form of procedure is established under which changes in existing agreements, theoretically, can be made when justified.

"The Administration, in an effort to continue its reciprocal trade agreement policy, has caused legislation to be introduced extending until 1940 the authority previously granted the President to make such agreements. When the joint resolution was before the Committee on Ways and Means of the House of Representatives, the Import Committee, through its counsel and staff, assisted three branches of the paper industry in the preparation and presentation of factual statements showing the losses sustained through agreements already in effect. As was expected, the House of Representatives adopted the joint resolution over the protests of many agricultural and industrial groups, and the Finance Committee of the Senate has also conducted hearings on the measure.

"Importing interests have announced their hope of securing modifications of administrative provisions of the existing Tariff Act, and if such action is initiated it will be the duty of the Import Committee to provide the data necessary to prevent action detrimental to the interests of the paper industry. The reported plans of the importers include a modification of the regulations requiring marking of imported goods to show the country of origin, and to take from domestic manufacturers their present rights of recourse to the Customs Courts. The importers have wide privilege of appearance in the Custom Courts, but it was only in comparatively recent years that the same right was extended to domestic interests for action in their own defense.

"The success of the Import Committee in stopping the German barter program was a notable accomplishment of the year. Under this practice shipments were being made at a sale price of more than 30 per cent below the proper price. At first the officials at Washington believed that the German procedure, while evidently a violation of the spirit of our tariff law, was technically beyond the reach of the law. The Committee, however, continued its efforts with the final result that the officials issued orders which caused the German government to abandon its use of a special currency for its foreign trade. This decision immediately stopped the rapidly growing exports of undervalued paper to this market.

"Although there has been an average of from one to two cases a day in which importations of paper have been under investigation because of suspected undervaluation or misclassification, this report will not review the individual activities of the Committee which have been presented to the industry in its monthly letters. Some outstanding developments, however, should be mentioned.

"Imports of paper, exclusive of standard newsprint, increased nearly 20 per cent during 1936 as compared with 1935, or nearly twice the percentage of increase in domestic production. Of this increase in imports, totaling two and a quarter million dollars in value, the larger portion was papers on which the reciprocal trade agreements had reduced the rate of duty.

"Imports of kraft wrapping paper, on which the duty was reduced from 30 per cent ad valorem to 20 per cent, totaled 24,000 tons in 1936, or twice the imports of 1935 and six times the total of 1934. In addition importers are endeavoring, through cases now pending in the Customs Courts, to avoid payment of duty on the value fixed by the Scandinavian mills for the sale of kraft paper in the home market.

"Sales to the United States are made at a price about 1 cent per pound less than the ruling price in the home country, where the Scandinavian cartel fixes a sales price. Because this price is arbitrarily fixed by the trust, the importers claim it is not the correct dutiable value. If the importers win their case the cost of such paper delivered in the American market can be lowered $4 per ton.

"The reciprocal trade agreement with Sweden reduced the rate of duty on wrapping paper. Importers of such Kraft papers as envelope and duplex are trying to secure this reduced rate on their shipments also but these efforts are being combatted by the Committee.

"Importers of M. G. sulphite wrapping are also endeavoring to secure a lower dutiable value on their shipments, on the same basis as that explained for kraft shipments. Imports of wrapping paper other than kraft more than doubled in 1936 as compared with 1935.

"The same increase is found in shipments of greaseproof and similar papers. These grades are being imported in increasing quantities at prices too low to be justified in view of the rapidly increasing value of the pulp from which they are produced, and the Committee is taking vigorous action to prevent evasion of the law in such shipments.

"The attractive American market for groundwood printing papers has resulted in an increase in the imports of such papers. However, efforts of importers to evade the payment of duty on such papers by claiming them to be duty free as standard newsprint have almost ceased. A long series of cases in the United States Customs Court affecting papers not used by newspapers discouraged the importers from making this claim. Imports of such paper in 1936 were 10,000 tons, exclusive of hanging paper, more than double the 1935 importations.

"From the above summary of the high lights of the work of the Import Committee for the year 1936 it can be seen that it has fully lived up to its past record for efficiency. Its activities in checking specific efforts of importers to evade the tariff law, and its general participation in the solution of broad problems of foreign trade policy affecting the paper industry have been fully as important as at any time in its thirteen years of existence. The Committee is widely recognized for its conservative policy, combined with a precise knowledge of foreign trade problems. The Import Committee has brought to the American Paper Industry the deserved reputation of having the most practical and effective tariff program of any American Industry."

Technical Committee Report

Ernst Mahler, chairman, presented the report of the Technical Committee, as follows:

"During the past year the Central Grading Committee was superseded by the Technical Committee. The latter is broader in its conception. It functions principally as an administrative and policy group. In its meeting on November 6, 1936, the Technical Committee provided for a system of subcommittees. These subcommittees will deal with specific problems, and their activities will be correlated and generally directed by the Technical Committee. Four subcommittees have been created, one for instrumentation, one for classification, definitions, and grading, one for manufacturing and management problems, and finally, one for the coordination of research.

"The chairmen of these subcommittees have met with the Technical Committee, and the activities of each have been thoroughly discussed. Since these committees have just been organized, it is impossible to render a report on

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their activities. Attention should be given, however, to the work which was accomplished during the past year in the instrumentation field and also to the projected work on classification and definition.

INSTRUMENTATION REPORTS

"A year ago, the Central Grading Committee presented seventeen reports to the Association. Four of the reports described new instruments which were developed as a result of the Committee's program. Two of these are in wide use, and it is fully expected that the other two will be of increasing value to the industry. Nearly three hundred sets of reports, or approximately four thousand individual copies have been distributed to the industry during the past year. They are now being published in serial form in the PAPER TRADE JOURNAL.

"Last February, it was voted that an additional assessment of three cents per one thousand dollar sales should be levied for the purpose of continuing the instrumentation study. Since then, the Committee has received nine installments of $850 each, totaling $7,650, for this work. On several occasions, reports on the nature and status of this year's work have been rendered to the Board of Governors. The Committee is pleased to distribute on the occasion of these annual meetings, six new instrumentation reports. These are prepared in the same form as the reports of last year and continue the serial numbers. Seven or eight additional reports will be distributed within a few weeks.

RESEARCH RESULTS ACCEPTED BY INSTRUMENT MANUFACTURERS

"The Committee has reviewed on many occasions the purposes for this study and the necessity for its continuance. It is enlightening to quote sections of letters received from two different instrument manufacturers whose apparatus was studied in this year's program.

"After a careful study of one color instrument, a letter was written to the company manufacturing this particular instrument, commenting upon certain deficiencies. In its reply, this company said: "We have gone into the matter of a number of points you mentioned much more carefully . . . We check your results rather closely. Our statement . . . was based on information supplied to us by the manufacturer . . . Since receiving your comments we have tested a dozen or more cells and find variations as high as ten per cent, the average being somewhat lower than this. We appreciate your calling this to our attention, as this matter had rather carelessly escaped our observation."

"Another instrument sold for the purpose of measuring color was studied carefully in this program, and after considering the preliminary report on its instrument, the company wrote in the following fashion: "We might say, that as far as color measurements are concerned, we have decided that this is beyond the scope of the reflection meter, and we are therefore confining our claims to differences in shade and whiteness."

"It is significant that these instruments are among those which had been considered by individuals within the paper industry, and if it had not been for this program, the difficulties would not be apparent to prospective buyers. In addition, the information rendered has given the manufacturers an opportunity to improve upon their product so that it can be manufactured more accurately in accordance with the needs of the industry.

"Two industry committees have been organized for the purpose of cooperating in certain phases of the instrumentation program, and their willingness to participate has been gratifying to the Technical Committee.

CONSUMER GROUPS REQUEST STANDARD SPECIFICATIONS FOR PAPER

"The Committee continues to receive requests from different organizations or groups of consumers and users regarding standard specifications for paper. These requests have been answered in each instance in the same manner. The Committee can merely state that at this point it is studying carefully the properties of paper and the means of evaluating them, and it is hoped that this study will eventually give the information necessary to sound specifications.

"During 1935, the Central Grading Committee was requested by the Board of Governors to present a comprehensive program which would make it possible to achieve a sounder marketing structure for the paper industry. At that time, the Committee pointed out that two steps should be taken before significant progress could be made toward this goal. The first step was that of instrumentation. Paper properties and instruments must be carefully analyzed, classified, erroneous measurements discarded, and new measurements invented, wherever necessary. The instrumentation program has just completed its second year.

CLASSIFICATION AND DEFINITIONS OF PAPER

The second step outlined by the Committee on that occasion was the achievement of better system of classifications and definitions. In its meeting of November 6, 1936 the Technical Committee agreed that the time has come to initiate this second step in the program. This move was crystallized by the request of the Executive Committee that the book entitled "Classification and Definitions of Paper" be revised and brought up-to-date. The Committee felt very strongly that it would be futile merely to revise the wording of the current definitions; rather, the whole problem of classification should receive thorough study on the basis of recent experience and further knowledge of the field.

"In order that the job may be worth while, the Committee recommended that $15,000 be allocated to this work for 1937. It cannot promise that the work will be completed within the ensuing year because of the magnitude of the problem. The subcommittee structure for handling this project has been formed, however, and it is hoped that it will be possible to initiate the work soon.

"At this same meeting, the Technical Committee recommended that ten thousand dollars be appropriated for the instrumentation program during 1937. The Committee has outlined as far as possible the instruments and properties which are to be studied during this year. In order to be sure, however, that the program will conform to the more immediate needs of the individual associations, these groups were asked for their suggestions. Several have been received, and these will be studied by the Committee.

"The Committee continues to feel that this program is vital to the welfare of the industry and earnestly hopes that it will continue to receive the support and cooperation of all concerned in this work."

Trade Customs Committee Report

D. C. Everest, chairman, presented the report of the Trade Customs Committee, which follows:

"In the Committee organization of the American Paper and Pulp Association there is a Coordinating Committee which is designed to relate the activities of the Divisional Associations to promote greater uniformity in procedure and to improve upon association services and activities.

"The Committee was not active in this general field during the past year. Its efforts were restricted to the coordination of trade customs. In this work the Committee received notable assistance from the Trade Customs Com-

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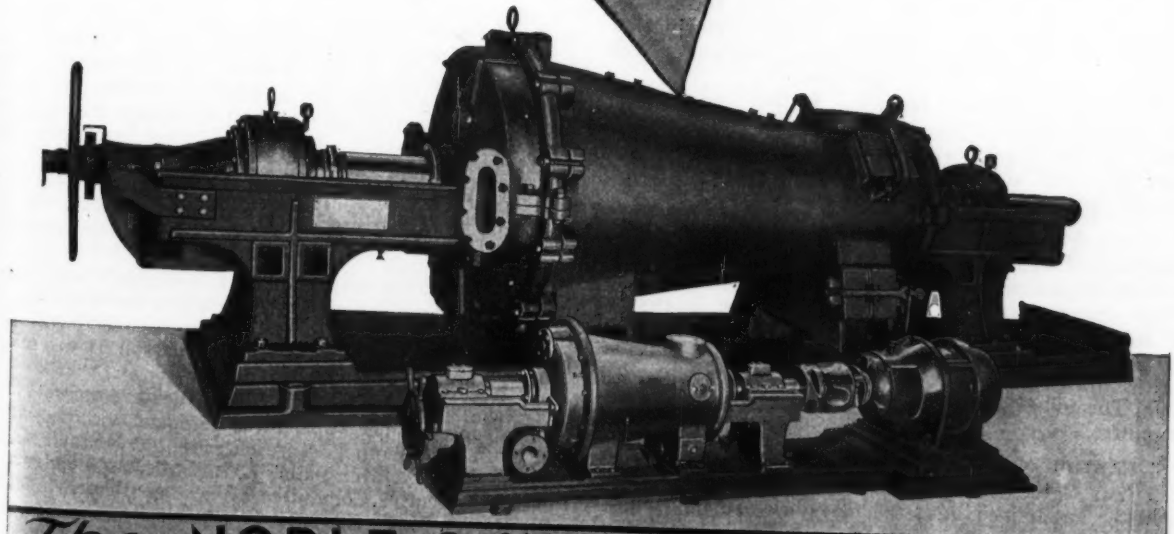

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mittee of the Salesmen's Association of the Paper Industry.

"Working in close cooperation with the Trade Customs Committee of the Salesmen's Association, the American Paper and Pulp Association's staff prepared a consolidated statement of the more important trade customs of eleven Divisional Associations. These trade customs were selected after careful study because of their general similarity. Then a study of means of bringing about greater uniformity was made. The staff and Salesmen's Association's committee decided to confine this year's activities to rearrangement of order and to grouping of the different customs of the associations under proper headings.

"The results of these studies were presented to the Committee at its meeting this week. After review, the Committee recommended that copies should be furnished to the Executive Committees and the Trade Customs Committees of the respective Divisional Associations and that each of these committees should be requested to review critically the work that has been done and forward as promptly as possible suggestions for improvement.

"Subsequently, after the comments and suggestions have been received, the Committee plans to distribute the consolidated statement to the industry for further trial. Eventually, the Committee hopes that the consolidated form of trade customs can be issued in loose-leaf form for general use by the members of the industry.

"In preparing the consolidated statement no changes whatsoever have been made in the trade customs, either in statement or in the figures used to designate standards and differentials. The consolidation has been confined to a rearrangement of the order of presentation and to grouping under appropriate headings of the principal provisions of each of the set of trade customs.

"This presentation not only will prove useful to the industry in the conduct of its every-day business, but it will also provide for each Divisional Association a thorough comparison in which the differences and in many cases inconsistencies between the Divisional Associations will be apparent.

"The Trade Customs Committee has also recommended to the Executive Committee that the committee be continued and that the program of activities for the ensuing year be directed to the reconciliation of differences in customs. It is proposed that after further study, recommendation will be made to the Divisional Associations and that eventually through a general cooperative program, a high degree of uniformity will be developed.

"The Trade Customs Committee further recommends that the Committee of the Salesmen's Association be continued and that it cooperate with the staff of the American Paper and Pulp Association and with the members of the central Trade Customs Committee in its current activities."

Cost Engineering Committee Report

Ralph A. Hayward, chairman, presented the report of the Cost Engineering Committee, which follows:

"The organization and program of the Cost Engineering Service, tentatively discussed at the December 10th meeting, has been completed and approved by the Cost Engineering Committee at their meeting on February 22, 1937. The following program has been established by the Committee.

CONTINUATION OF PRESENT SERVICE

"It was agreed that the present reporting program should be maintained until the new developments which are outlined further in this report, have been worked out. In this connection, the staff has been instructed to simplify the reports of the mills and to stress the importance of comparing statistical and cost elements in preference to the more intricate problems of distribution of expense. These alterations in our present program will simplify the work of preparing the reporting data and they will make the comparative reports more understandable and useable. Reports in the future will be issued by the Service quarterly instead of monthly.

FUTURE DEVELOPMENTS OF THE SERVICE

"In the future we will promote the comparative figures by trade groups. This will be handled by investigation and auditing of grade costs. The reports to the trade groups on these grade costs will be presented by a member of the staff giving maximum, minimum and average figures together with their opinion on possible changes in costs because of changing conditions. After a study has been made of the costs of a particular grade, the staff will organize any interesting and valuable facts that can be submitted regularly by the group and report them in comparable form for the use of the group. The cost of compiling such comparative information will be small and the resulting comparisons should be of real value.

"From time to time the staff will issue narrative statements on cost methods and control standards. These statements should be of material assistance in helping each mill to improve its methods of operation.

CONSULTING SERVICE

"The staff will be available for use by individual mills for auditing their existing cost systems and to advise them on the possibility of simplification or improvement of activities or report forms and, further, to advise the executives on the ways and means of further utilizing these figures for better operating control. The staff can also assist companies in installing new systems that will fit their individual problems of operation. Many mills have already used this service and it has proven both desirable and practical.

"The Committee feels that this program will result in the development of many fundamental standards of operations and that the use of these standards will be of great help to the trade groups in working out their standards and cost differentials."

Kraft Paper Association

W. H. Anders, of the Nashua River Paper Company, was elected president of the Kraft Paper Association at its annual meeting at the Waldorf on Wednesday. The meeting was attended by a large proportion of Kraft paper manufacturers who listened to reports covering the past year's operation. Plans were then formulated for the activities of the new year.

L. C. Anderson, the retiring president, was presented with a silver humidor as a token of appreciation for the services rendered during the past two years as president of the association.

The presentation was made by I. Zellerbach who voiced the sincere appreciation of the members for the example of constructive leadership and self-sacrificing devotion to his task which had endeared Mr. Anderson to his fellow manufacturers.

The other officers elected at the meeting were: N. S. Stone of the Mosinee Paper Mills Company, vice president; and L. C. Anderson, J. A. Auchter, E. A. Kendler, C. R. McMillen, R. A. McDonald, J. L. Stille, as members of the new Executive Committee. These gentlemen together with Messrs. M. E. Cody, H. S. Daniels, J. R. Miller, and C. W. Smith, who were elected last year to serve a two-year term, will comprise the Executive Committee for 1937.

Paper Salesmen's Association

As usual the Salesmen's Association of the Paper Industry played a prominent part in the paper convention. The annual meeting was held in the Waldorf-Astoria on Tuesday morning, when the following officers were elected for the forthcoming year:

President, E. R. Lyman, Missisquoi Corporation, New York.

Vice-President of Eastern Division, Hugh Phillips, International Paper Company, New York.

Vice-President of Western Division, John T. Burruss, Albemarle Paper Manufacturing Company, Chicago.

Secretary-Treasurer, Dr. E. O. Merchant, 122 East 42nd street, New York.

The address of the retiring president, R. C. Johnson, of the Northwest Paper Company, Chicago, follows:

"Each year we have the pleasure of gathering and looking back upon our accomplishments.

"First, we have added to our membership by the good work of the members; our membership chairman, Jim Hutchison in New York; Dick Cook in Chicago, and last, but not least, the Generalissimo of membership George Gibson.

"Our present membership is 260, an increase of sixty since the last annual meeting. While we have had added members, we pause in memory of those who passed on during the year, namely: A. N. Forsyth of American Writing, R. W. Butterworth of Champion Coated, Jack Shepherd of Peninsular, C. H. Phipps of St. Regis, and C. D. Van Wagner of Champion. We miss them and the support that they gave so willingly.

"George Gibson put out an excellent revised membership roster, on a permanent basis, which I am sure all members find very helpful. We again thank George for his good work.

"Dr. E. O. Merchant has done an excellent job in getting out the weekly bulletin. It is concise, to the point, and the data gives an accurate guide to what is happening in our industry. This alone is worth the price of membership.

"We have been trying to get the group of paper salesmen on the Pacific Coast in our association, but so far have not been successful.

"The vice-presidents of New York and Chicago will give reports on their special activities and meetings. The summer social activity is golf and it continues to be very successful. Years ago it used to be a job to get up a foursome of guests, but not so now, and one does not have to do much urging of guests to take in golf outings, which grow larger each year.

"We have also tried to interest various hotel chains to give special attention to members of our association and we are receiving co-operation from some of them. The membership cards we have issued this year will be recognized by the DeWitt Hotels, Statler and Ralph Hitz Hotels. We expect that many more will give us the same courtesy. When you stop at these hotels, use the blue membership card. It will be helpful to you and the S. A. P. I.

"Sometimes the question is asked, 'What good do we get out of the Association?' It seems to us the main good is the acquaintance, good fellowship and confidence fostered between mill representatives, which, is so important and helpful to ourselves, our companies that we work for, and the indutsry as a whole.

"The salesman must keep his plant supplied with orders and proper information. It is of utmost importance that facts are obtained regarding competitive and business conditions; one must distinguish between fact and rumor. If all sales representatives would make it a practice to get to the bottom of all facts, there would be less price upheavals and less turmoil between mills.

"Our members are able to check information with each other. Salesmen should bear in mind that rumors are often started in order to create conditions temporarily advantageous to unscrupulous buyers. Salesmen should not fall for that racket.

"It is much harder to say 'No' than 'Yes' to the tempting siren represented by large tonnage at cost or below cost, but 'No' might make more profit for your mill. Many times during the past four or five years many unprofitable orders were taken in order to keep plants from shutting down.

"The past year has seen a change for the better. Today production and distribution are about even in some fields and in some, over-sold conditions exist. At a time like this, a salesman's value is great if he can guard his mill against over-selling at low prices.

"There are different methods of making prices followed in the paper industry. Some of the Industry's product is sold on contract bases, where prices are guaranteed for ninety day periods; some is sold on basis for shipment within thirty days, and some is sold on basis of price prevailing at time of shipment.

"For these various methods there, no doubt, are good reasons depending upon the kind of business the particular mill is engaged in. For general merchandising, some of these pricing methods are not as satisfactory as others.

"Probably the least satisfactory is price prevailing at time of shipment on mill shipment orders. Those who remember 1920 and 1921 should know that price prevailing practice was considerably abused in this manned. Many buyers not certain of getting as much paper from their regular source (that is, more than they had bought before) placed the additional tonnage with several mills hoping somebody would be able to make quick shipment.

"This worked fine for the buyer, but not so well for the mill, because when the toboggan slide of prices began, many mills saw all their business, that they thought secured, disappear in thin air, causing heavy loss to all concerned. Again the experienced salesman is most valuable to his mill in knowing the difference between real and speculative business.

"As salesmen, we are all interested in seeing our mills make profits. Along this line we have been trying to get some Simplification of Trade Customs and Practices adopted. The A. P. & P. A. has been co-operating.

"Trade Custom differentials are a part of every price you make. These differentials seem to have different applications dpending upon what association that particular paper is classified with. You are familiar with the customs of the association your mill is classed with.

"To illustrate our point in unifying customs, we will point out one discrepancy: In the Groundwood and Book Associations the charge for trimming four sides is 15 cents per cwt., while in the Kraft and Sulphite Associations the charge is 20 cents per cwt. for doing the same thing. There are many such discrepancies which should be corrected.

"As stated before, differentials are a part of the price and with the ever mounting costs before us, we think that now is the time to get trade customs differentials revised to uniformity.

"Our committees in Chicago and New York have worked hard on this. We, as an association, hope this

work can be accomplished and feel all salesmen will continue their good efforts in this direction.

"We remember the difficulty and hard work encountered by members of this assiciation fourteen years ago when they formed what is now the Import Committee, which has saved the industry millions of dollars.

"There are, according to 1935 figures, 760 mills in the United States. We have represented approximately 225 of them in this association, but have very few board mills. Our growth depends on how much constructive work we do.

"One must not think of how much he gets individually, but how much he can do for the good of all that makes for success of the association and the industry as a whole. Success for the industry will pay us according to our works.

"In closing this report, I want to thank the members of Committees, Committee Chairmen, Vice-Presidents Ted Lyman and Jack Burruss, Dr. E. O. Merchant, members of the trade press, and last, but not least, the Luncheon Committee.

"I know that my successor will do an excellent job of carrying on for continued growth and service of the S. A. P. I."

E. R. Lyman, vice-president of the Eastern Division, and John T. Burruss, vice-president of the Western Division, read the reports of the activities of their respective sections during the past year.

Record Luncheon

Approximately eight hundred members and guests—a record attendance—graced the Eighteenth Annual Luncheon of the Salesmen's Association of the Paper Industry, which was held in the Waldorf-Astoria on Tuesday afternoon. R. C. Johnson, the retiring president of the association, was an efficient chairman.

Seated at the speakers' table besides Mr. Johnson, were:

Frank J. Sensenbrenner, president; D. Clark Everest, vice-president; C. W. Boyce, executive secretary; and Carl E. Whitney, counsel, of the American Paper and Pulp Association. E. R. Lyman, president; John T. Burruss, western vice-president; and Hugh Phillips, eastern vice-president of the Salesmen's Association of the Paper Industry; Professor Alvin C. Busse, professor of public speaking at New York University; Professor Richard C. Borden, former professor of Marketing at New York University, and Dr. E. O. Merchant, secretary of the association.

F. J. Sensenbrenner, president of the American Paper and Pulp Association, extended the greetings of the parent organization to the gathering. He said:

"I am particularly glad to extend to you a word of welcome on behalf of the American Paper and Pulp Association, because it gives me an opportunity to compliment the Salesmen's Association upon its assistance in codifying the industry's trade customs and practices. I have followed the work of your committee and I have confidence that it will be a valuable contribution to our group activities.

"My experience in the industry, which now stretches over a period of five decades, has made me generally familiar not only with manufacturing but selling problems. I fully appreciate the necessity for trade customs. Our products are so great in number and the requirements of use demand so many different sizes, weights, colors, packing, finishing, etc., that orderly marketing would be almost impossible if we were not able to standardize our practices.

"The formulation of recommendations based upon customs that have been thoroughly tested in practice is an important function of our association work. Who is in a better position than the salesman to determine not only the effectiveness of our practices but also the inconsistencies and contradictions that are bound to creep in.

"This work is an example of co-ordinated effort that brings together the forces of the industry to concentrate upon a common problem. It is to be commended.

"The surprising volume of sale in 1936, which actually established a new all-high record, is convincing evidence that the depression is behind us. I believe that we can look forward to a period of continued large volume. It may be that the 1937 record will not greatly exceed that of 1936, but even so the industry as a whole is in a relatively advantageous volume position.

"The prospects also indicate a closer relation between supply and demand, with demand actually out-running supply in the case of some of our products, which enhances the possibilities of advancing prices. In fact in many grades prices have already increased. The industry as a whole seems to be rapidly approaching a point at which it can rebuild its resources that were so severely depleted during the six years of the depression. We appear to have a rising market before us.

"It is a surprising fact that most men in the industry have had little selling experience in a rising market. From 1920 until only recently the curve of paper prices has been downward. In the change from a downward to an upward trend we may need different technique, perhaps a different psychology.

"An expanding market in which sales may be made more easily, also has new problems. Group activities designed to disclose possible solutions are just as important today as they were in the depression. It is particularly important for the salesman to keep informed not only as to market conditions, but also as to industry development. Knowledge of product goes hand in hand with confidence in the quality of the product and in the position of one's company as the prerequisites of selling.

"Manufacturing volume is the first prerequisite to profitable operation in the paper industry. The margins between unit costs and prices are generally so narrow that the influence of idleness is especially great. Idleness can result either from shrinkage in consumption or from too great production capacity.

"The industry is today expanding rapidly. New mills and speeding up of existing machines are adding substantially to capacity. Consumption is also increasing but whether or not it will increase enough to absorb the new capacity as it comes into production is questionable. Sales promotion that will encourage greater paper use is essential.

"Sales promotion is surely a function of the salesman. He has opportunities to seek out new uses and to make more secure and permanent existing uses. The combined efforts of all salesmen will be required if the industry is to escape an accumulation of idle capacity as production facilities increase.

"Too frequently in rising markets, the art of selling is permitted to deteriorate. The salesman may become simply an order taker. Of this I wish to warn you. We can see clearly what is necessary to make permanent a reasonable prosperity in the industry. We cannot afford to rest on our oars in the light of this knowledge, even though the production of our mills may be completely sold out."

D. C. Everest Speaks

"As Chairman of the Trade Customs Committee of the American Paper and Pulp Association, I take great pleasure in reporting to you at this time upon the ac-

tivities of the Trade Customs Committee of the Salesmen's Association.

"This statement may appear to be ambiguous, but I assure you that it is not. The Trade Customs Committee of your Association, working in co-operation with the staff of the American Paper and Pulp Association, has made notable progress this year in the consolidation and co-ordination of the trade customs of the industry.

"This is an achievement that, I think, will stand out among the records of co-operative activities during the past year. For years, in fact, ever since I have been connected with the paper industry, sporadic attempts have been made to bring about a codification of trade customs. I have attended many meetings at which this subject has been discussed.

"The result of all these meetings, except one, has been an agreement among everybody present that something should be done, but nothing ever was done. The one exception is the meeting of the Trade Customs Committee that was held yesterday morning. At this meeting a consolidated statement was presented covering the standards and differentials of eleven Divisional Associations.

"The present study—and it is a study—is confined chiefly to re-arrangement and the consolidation in one statement of the more important customs of several Divisions. No attempt has been made as yet to reconcile the differences in standards and in differentials. This must await further study.

"The principal reasons for the re-arrangements are twofold: first to put into the most usable form for the industry the particular customs of these eleven divisions, and, second, to provide a comparison of statement and of figures with the hope that, if attention is called to them, the differences and inconsistencies may eventually be eliminated.

"I am glad to say that the Trade Customs Committee will recommend to the Executive Committee of the American Paper and Pulp Association two further steps:

"The first will be to limit the immediate distribution of the consolidated statement of trade customs to the indusry, first, to obtain the approval for subsequent wider distribution and, second, to obtain comments and suggestions as to improvement.

"The second recommendation will be to continue the activities of the Committee, and especially to attempt in the forthcoming year a revision of certain of the Divisional Association's trade customs in order that the highest degree of uniformity may be secured.

"If the Executive Committee approves these recommendations, we shall be in a position to carry this work forward. I do not doubt that the Executive Committee will approve them. I know also, that the Executive Committee of the American Paper and Pulp Association will, by appropriate resolution, recognize the assistance of the Trade Customs Committee of the Salesmen's Association.

"I want to emphasize again the important contribution that this Committee has made."

The luncheon concluded with an instructive and amusing act by Professors Richard C. Borden and Alvin C. Busse, who demonstrated the main principles of winning sales argument in a convincing manner.

In conclusion the luncheon committee, of which W. L. Raymond was the chairman, are to be congratulated on the undoubted success of the event.

Writing Paper Manufacturers' Association

Several meetings were held by the Writing Paper Manufacturers' Association, and officers for the forthcoming year were elected as follows:

President, H. S. Madden, American Writing Paper Company, Inc., Holyoke, Mass.; vice-presidents, A. C. Gilbert, Gilbert Paper Company, Menasha, Wis., and G. P. Lee, Eastern Manufacturing Company, 500 Fifth Avenue, New York. Executive Secretary, E. H. Naylor, and treasurer, M. C. Dobrow, 122 East 42nd street, New York.

Executive Committee: R. S. Madden, chairman; H. R. Baldwin, Hammermill Paper Company, Erie, Pa.; A. C. Gilbert; H. H. Hanson, W. C. Hamilton & Sons, Miquon, Pa.; H. F. Harrison, West Virginia Pulp and Paper Company, 230 Park Avenue, New York; G. P. Lee; H. A. Legge, The Howard Paper Company, Urbana, Ohio; L. E. Maglathlin, Keith Paper Company, Turners Falls, Mass.; F. H. Savage, International Paper Company, 220 East 42nd street, New York; W. C. Wing, Jr., Fox River Paper Company, Appleton, Wis., and J. D. Zink, Strathmore Paper Company, West Springfield, Mass.

Sulphite Paper Association

At the Waldorf-Astoria on Tuesday the Sulphite Paper Manufacturers Association held its annual meeting at which the following officers were elected:

General chairman, H. O. Nichols, Crown Willamette Paper Company; vice-chairman, Unbleached Group, George Stuhr, Southern Kraft Corporation; vice-chairman, Bleached Group, Rufus I. Worrell, Mead Sales Company; vice-chairman, Manilas Group, Rufus L. Sisson, Jr., Racquette River Paper Company; vice-chairman, M. G. Sulphite Group, Edgar W. Kiefer, Port Huron Sulphite and Paper Company. Thomas J. Burke is secretary-treasurer.

The following were elected to the Board of Governors in addition to the officers named above:

John E. Alexander, Nekoosa Edwards Paper Company; Aubrey Crabtree, Fraser Paper Ltd.; Walter B. Merlin, Hollingsworth & Whitney Company; John Stevens, Jr., Marathon Paper Mills Company; L. F. Porter, Northwest Paper Company.

Cover Paper Manufacturers Association

At the meeting of the Cover Paper Manufacturers Association held at the Waldorf-Astoria Tuesday, February 23rd officers were elected for the ensuing year. They are as follows:

President, G. H. Beckett, Beckett Paper Company; secretary, E. H. Naylor; treasurer, M. C. Dobrow. Executive Committee: G. H. Beckett, Beckett Paper Company; F. E. May, Rising Paper Company; A. E. Frampton, Hammermill Paper Company; W. J. Warner, The Marvellum Company, and T. D. Quirk, Peninsular Paper Company.

Machinery Association Reelects

All the officers of the Pulp and Paper Machinery Association were re-elected at its annual meeting held Tuesday at the Waldorf-Astoria Hotel, as follows:

President, Phillips Dennett, president, Bird Machine Company; vice-president, Charles Bauer, Bauer Brothers Company; treasurer, W. B. Wilshusen, president, Cameron Machine Company, and secretary, John Cornell, of **The Paper Mill.**

Technical Association Luncheon

The Twenty-second Annual Luncheon of the Technical Association of the Pulp and Paper Industry was a huge success, being one of the largest attended in the history of the association.

President G. N. Collins presided at the speakers table and welcomed members and guests of TAPPI.

Mr. Collins introduced first the guest speaker, Roderic Olzendam, director of the Social Security Bureau of the Metropolitan Life Insurance Company, who spoke on the Social Security Act.

The main feature of the TAPPI luncheon was the presentation to Dr. Clarence J. West of the TAPPI gold medal in recognition of his service to the pulp and paper industry in the field of research and scientific literature. The presentation was made by Dr. Harry F. Lewis, dean of the Institute of Paper Chemistry. Dr. West did not read his prepared talk, but gave a few extemporaneous remarks, introducing himself by saying that the "ghost of TAPPI stands before you."

Both Dr. Lewis' presentation speech and Dr. West's acceptance speech are printed in full elsewhere in this issue.

Mr. Collins then introduced Colonel Butler, chairman of the Industrial Committee of Savannah, who extended an invitation to TAPPI to hold its next convention there. Mr. Collins announced that the Fall Meeting of TAPPI would be held in Savannah early in October.

Groundwood Paper Association

C. H. Sage of the Kimberly-Clark Corporation was re-elected president of the Groundwood Paper Manufacturers' Association at the annual meeting held yesterday.

The other officers and the board of governors were all re-elected. Samuel Pruyn, of Finch, Pruyn & Co. is Eastern vice-president; J. H. Coy, of Flambeau Paper Company, Western vice-president; R. E. Canfield, executive vice-president, and Dr. E. O. Merchant, secretary-treasurer.

Members of the Board of Governors include G. H. Fay, of Mead Sales Company; L. L. Alsted, of Combined Locks Paper Company; Walter Shorter, of International Paper Company; E. G. Murray, of St. Regis Paper Company; Aubrey Crabtree, of Fraser Paper Ltd.; H. O. Nichols, of Crown-Willamette Paper Company and the officers.

Cardboard Manufacturers' Association

The Cardboard Manufacturers' Association held its annual meeting on Monday. Kendall Wyman, of the Champion Paper and Fibre Company, was re-elected president, while John B. Van Horn of the Holyoke Card and Paper Company, was re-elected vice-president. James L. Ritchie, 122 East 42nd street, New York, still fills his position as vice-president and secretary.

At the final meeting on Tuesday morning the executive committee was elected as follows: Mr. Wyman, Mr. VanHorn, J. A. Moses, Falulah Paper Company; F. C. Heinritz, Appleton Coated Paper Company; D. V. Lowe, Lowe Paper Company, and Herman Harrigan, District of Columbia Paper Manufacturing Company. Out of this group Mr. Heinritz has been appointed as chairman of the Coated Tag Group; Mr. Moses, of the Blanks Group; Mr. Lowe of the Coated Box Group; and Mr. Harrigan, of the Photo Mount Group.

Roll Toilet Tissue Association

The Roll Toilet Tissue Association, Division of Association of Manufacturers and Converters of Tissue, held its election of officers at the Waldorf-Astoria, Tuesday, February 23.

The officers for 1937 were elected as follows: Chairman, Edward Yulke, Southern Kraft Corporation, New York; co-chairman, H. Wintgens, Hoberg Paper Mills, Inc., Green Bay, Wis.; executive secretary, M. A. Lund.

Executive Committee—Grafton Houston, Fort Howard Paper Company, Green Bay, Wis.; Wayne Brown, National Paper Products Company, New York; Bert Reider, Victoria Paper Mills, Fulton, N. Y.; Edward E. Reed, Reed Tissues Corporation, Little Falls, N. Y.; C. Alfred Wagner, Stevens & Thompson Paper Company, New York; A. Ginsburg, M. A. King Company, Somerville, Mass.; L. Rossiter, Peerless Paper Mills, Oaks, Pa.; S. Lopin, Mazer Paper Mills, Lansdowne, Pa.

U. S. Pulp Producers Association

The annual meeting of the United States Pulp Producers Association was held in the Waldorf-Astoria on Monday, February 22. The following officers for the coming year were elected:

President, Amor Hollingsworth, Penobscot Chemical Fibre Company; vice-president, Stuart B. Copeland, Northwest Paper Company; secretary, Oliver M. Porter, 122 East 42nd street, New York.

Executive Committee: Russell La Roux, Consolidated Water Power and Paper Company; J. R. S. McLernon, Ranier Pulp and Paper Company; A. H. Showalter, Mt. Tom Sulphite Pulp Company; Norman W. Wilson, Hammermill Paper Company; R. B. Wolf, Pulp Division, Weyerhaeuser Timber Company; Ossian Anderson, Puget Sound Pulp and Timber Company; D. P. Brown, Brown Company, and J. M. Conway, Hoberg Paper Mills, Inc.

Paper Towel Manufacturers Association

Milan Boex, of the Northern Paper Mills, Green Bay, Wis., was elected president, and Wayne A. Brown, of National Paper Products Company, New York, vice-president of the Association of Paper Towel Manufacturers at its annual meeting in the Waldorf-Astoria on Wednesday.

The Executive Committee for 1937 includes: Ralph Rhoads, Scott Paper Company, Chester, Pa.; Ed E. Reed, Reed Tissues Corp., Little Falls, N. Y.; George Stuhr, Southern Kraft Corp., New York; Merrill Flint, Brown Company, New York; Joseph Mazer, Mazer Paper Mills, New York; Chas. Ernst, Jr., Rockland Paper Company, Rockland, Del.; Bruce Livvy, Wortendyke Manufacturing Company, Richmond, Va.

Interfold Tissue Association

C. Alfred Wagner, of the Stevens & Thompson Paper Company, was again elected chairman of the Interfold Tissue Association, a Division of Association of Manufacturers and Converters of Tissue, at the meeting held at the Waldorf-Astoria on Monday, February 22. Milan Boex, Northern Paper Mills, was elected vice-chairman.

Members of the executive committee are: Dwight D. W. Hollister, A. P. W. Paper Company; Robert Black, Morgan Paper Company, Division, United States Envelope Company; H. G. Wintgens, Hoberg Paper Mills, Inc., and Wayne Brown, National Paper Products Company.

The Great Northern Grinder

U. S. Patent No. 1757031

PARTIAL VIEW OF GRINDER ROOM CONTAINING 12 GREAT NORTHERN GRINDERS

POINTS OF OUTSTANDING ADVANTAGE

(1) PRODUCTION PER STONE—25 TONS AND UPWARD WITH 4-FT. WOOD

The large effective grinding area and method of feeding wood to the stone assure high production.

The efficiency of the operator is automatically checked.

Hazards are eliminated insuring maximum freedom of operation and security to the operator.

(2) MODERATE COST OF INSTALLATION

Cost of grinders including installation is relatively low.

No overhead filling loft is necessary, space occupied is less than for any other type of modern grinder, and where replacing 2 ft. grinders, existing building may be easily adapted to the new installation.

(3) LOW OPERATING AND MAINTENANCE CHARGES

Minimum operating costs are permitted by the high rate of production and by the ease of getting wood to the grinders.

The solid design and sturdy construction insure low maintenance costs.

New stones can be easily installed.

(4) DESIGN OF GRINDER ADAPTED FOR POSITIVE CONTROL OF QUALITY

The surface of the stone is easily inspected and accessible for adjustment.

Wood approaching the grinders is always in view for inspection, and wood is delivered to the grinder by a water conveyor, loose dirt and bark being removed in conveyor.

Automatic temperature controls are easily installed.

(5) WATER CONVEYOR AND VENTILATION

The water conveying of wood direct to the grinder contributes to a minimum of labor, power consumption, and maintenance expenses. It also is a vital factor in obtaining best quality.

Working conditions are healthy; the method of ventilating the grinder eliminates fog in the room even in the coldest weather.

(6) THE RECORD

All important Grinder installations in the United States during the past seven years have included the Great Northern design.

We should welcome the opportunity of making, without obligation on your part, a study of your grinder problems.

MONTAGUE MACHINE CO.

Turners Falls, Mass.

Paper Mill Supplies Dinner

On Wednesday evening the New York Association of Dealers in Paper Mill Supplies, Inc. held its twenty-ninth annual banquet in the East Ballroom of the Hotel Commodore. The record breaking attendance and enthusiasm of the guests marked the banquet as the most successful ever held. The enthusiasm of the members and their guests reached its peak during the excellent entertainment after the dinner. Tables were reserved for the following companies:

Arrow Waste Paper Company, Sol Ash, Inc., D. Benedetto, Inc., Robert Blank, Inc., A. Bloch Co., and C. J. Browne.

D. Cantasano, Jas. Carrano and son, Crosby Paper Stock, Darmstadt, Scott & Courtney, Derrico Company, Economy Baler Company, and Ethyl Mill Supply Company.

James T. Flannery & Company, Gaccione Bros. & Company, Giove Company, Inc., H. Goldman & Company, Louis Gottlieb & Bro., and John D. Greco.

Hicks Costarino & Co., Inc., Daniel M. Hicks, Inc., Gus A. Johnson, Inc., E. J. Keller & Company, and Loumar Textile By-Products Inc.

Chas. Maronna & Company, Geo. W. Millar Company, Inc., L. & R. Moelis Company, A. J. Moran & Company, Inc., and National Association of Waste Material Dealers.

S. Schapiro & Sons, W. Steck & Company, Sterling Mill Supply Company, Toga Paper Stock Company, Inc., Valva Paper Stock Company, Whaling Waste Products Company, and Wilson Paper Stock Company.

Linweave Association

James L. Wells of the Sloan Paper Company, Atlanta, Ga., was elected president of the Linweave Association at its annual meeting last Saturday afternoon in the Jansen Suite at the Waldorf-Astoria. David Landau, of the Alling & Cory Company, New York, was elected vice-president, and J. H. Brewer of the Storrs & Bement Company, Boston, secretary-treasurer.

Members elected to the Executive Committee include: James L. Wells, David Landau, J. H. Brewer, L. A. Ramaker, Bouer Paper Company, Milwaukee; E. R. Mulnix, Carpenter Paper Company, Grand Rapids; Harold Zellerbach, Zellerbach Paper Company, San Francisco, Al Scharf, alternate.

The Linweave Sales Trophy, an engraved two-color plaque, which is awarded annually for the largest percentage of increase in sales was won by Alling & Cory Company, one of the three distributors of Linweave papers and envelopes in New York.

Newsprint Manufacturers Association

At the annual meeting of the Association of Newsprint Manufacturers of the United States held Wednesday morning at the Waldorf-Astoria, E. L. Crooker of the International Paper Company was elected to succeed J. L. Fearing on the Advisory Committee.

The other officers were all reelected as follows:

Chairman, A. L. Hobson, St. Croix Paper Company; vice-chairman, C. K. Blandin, Blandin Paper Company and J. D. Zellerbach, Crown Zellerbach Corporation.

Advisory Committee members are: Samuel Pruyn, Finch, Pruyn & Co.; R. H. M. Robinson, Minnesota and Ontario Paper Company; Harold S. Smith, Maine Seaboard Paper Company and E. L. Crooker, International Paper Company.

Technical Association Officers

The officers of the Technical Association of the Pulp and Paper Industry were all reelected for 1937, as follows:

President, G. N. Collins, Stevens & Thompson Paper Company; vice-president, W. R. Maull, Dill & Collins, Inc.; secretary-treasurer, R. G. Macdonald, 122 East 42 street, New York.

John Traquair of the Mead Corporation, and W. M. Shoemaker of the National Vulcanized Fibre Company succeed G. W. E. Nicholson, Southern Kraft Corporation and H. U. Kiely, American Writing Paper Company on the Executive Committee. Other members of the Executive Committee include: G. N. Collins, W. R. Maull, H. R. Murdock, Champion Fibre Company; W. A. Swanson, Kimberly-Clark Corporation; M. H. Teaze, Hardy S. Ferguson & Company; Roger C. Griffin, Arthur D. Little, Inc.; A. E. H. Fair, Alliance Paper Mills, Ltd.; W. J. Lawrence, Paper Makers Chemical Corporation; Albert Bankus, Crown Willamette Paper Company, and R. G. Macdonald.

Sulphate Pulp and Board Association

The American Sulphate Pulp and Board Association held its annual meeting at the Waldorf-Astoria Hotel on Wednesday. These officers were elected for the coming year: President, S. M. Phelan, West Virginia Pulp and Paper Co., vice-president, W. J. Meyer, Brown Paper Mill Company., secretary-treasurer, S. M. Hudson, 19 W. 44th street, New York.

On the executive committee are Mr. Phelan, Mr. Meyer, R. H. Bursch, Southern Kraft Corporation, H. W. Ellerson, Albemarle-Chesapeake Corporation, D. C. Everest, Ontonagon Fibre Corporation, A. C. Goodyear, Bogalusa Paper Company, H. L. Wollenberg, Longview Fibre Company, J. D. Zellerbach, National Paper Products Company, P. P. Schnorbach, Filer Fibre Company.

The meeting reviewed the activities of the past year's operations and laid plans for its activities for 1937.

Bristol Board Manufacturers' Group

The Bristol Board Manufacturers' Group held its general meeting at the Waldorf-Astoria on Tuesday. With R. G. Westad, of the Waterfalls Paper Mills, acting as chairman, the following officers were elected:

Chairman, R. I. Worrell, Wheelwright Paper Company; vice-chairman, James Ramage, Franklin Paper Company; secretary-treasurer, James L. Ritchie.

On the Executive Committee are J. E. Holmes, Chemical Paper Manufacturing Company; Norman Harrower, Linton Paper Company, James Rylands, Standard Paper Manufacturing Company, and R. G. Westad, Waterfalls Paper Mills.

Blotting Paper Manufacturers

At the annual meeting of the Blotting Paper Manufacturers Group held Wednesday morning, H. W. Langtree, of the District of Columbia Paper Company, and the Wrenn Paper Company, was appointed president The vice-president is H. S. Mead, of the Wrenn Paper Company.

Specialty Paper and Board

The Specialty Paper and Board Affiliates discussed conditions affecting its interests at the meeting held Wednesday afternoon. Officers were not elected at that time, plans being made to do that at a meeting of the executive committee next month.

MODERNIZATION

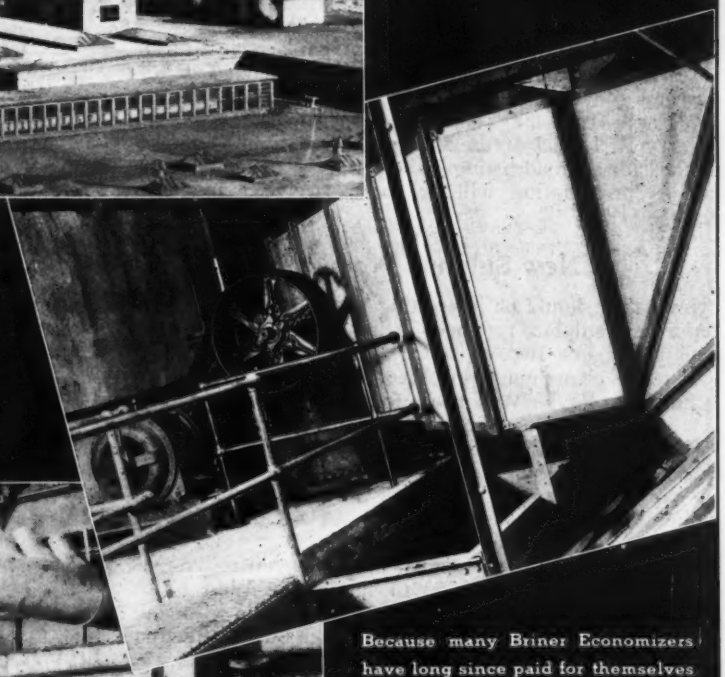
should include necessary replacements of

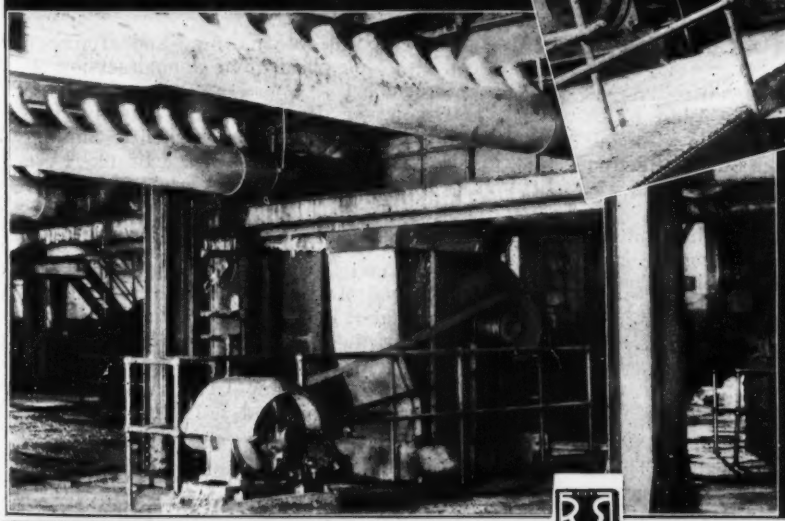
Briner Economizers

Above--Briner Economizer installation showing fan houses on Machine Room roof.

Right--Apparatus and connections.

Below--Briner Economizer installation showing Felt Supply Systems.





Because many Briner Economizers have long since paid for themselves in the savings they have effected, the normal result of long use on their efficiency has been entirely overlooked. Necessary replacements in many mills can be considered as a paying investment and should be made as a part of modernization programs. Our engineers will gladly assist in checking over your present equipment.

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To Broadcast Story of Paper

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., February 24, 1937.—A fascinating as well as educational radio broadcast on "The Paper Industry of the United States" is to be released over a nation-wide hookup on March 6, according to P. A. Hayward, Chief of the Forest Products Division of the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C. This broadcast will be on the air from 3:30 to 4:00 p. m., Eastern Standard Time and is one of the series on "The Story of Industry" being presented on Saturday afternoons by the Department of Commerce and the Columbia Broadcasting System.

Few industries or few products present as interesting a story as do the paper industry and paper. The paper industry is today one of the Nation's tremendously large industries, the value of its products reaching the staggering sum of a billion dollars annually.

Starting from a tiny one-mill affair near Philadelphia in 1690, with rags as the raw material, the industry has with the change to wood stretched itself from Coast to Coast until its payroll now numbers over 220,000 persons. The broadcast will not only build a perspective of this historical aspect of the industry for the listener but will point out some of the present-day high lights of the industry and of its indispensable products.

Harry R. Daniel of the Department of Commerce will tell the story, broadcasting direct from Washington. Mr. Daniel's presentation will be about twelve minutes in length.

New Sulphur Producer

News that should be interesting to the sulphite trade is that a new sulphur producer is in the market, by name Sulphur Diggers, Inc., of which Sidney B. Wood, Jr., famous tennis champion, is president, and a man well known to the trade, W. N. Wilkinson, for many years sales manager of the Union Sulphur Company, is general manager.

This new producer has very extensive deposits of sulphur located in Inyo County, California, and they have just perfected plans to put on to the market a grade of sulphur that will equal and perhaps exceed in purity the sulphur produced in the Gulf States.

The location of the property being in California puts them in an enviable position to supply the West Coast mills and will enable them to approach the mills with confidence that they can give not only service but satisfactory prices and their proximity to the consuming market will be a guarantee of an uninterrupted flow of supplies.

Mr. Wilkinson has been in attendance at the Convention, answering numerous questions and passing the good word along to the consuming trade. The main office of the company is 3923 West Sixth street, Los Angeles, California, and they also have an office in the name of Sidney B. Wood, Jr., at 76 Beaver street, New York.

Western Paper Merchants Elect

The annual meeting and election of officers of the Western Paper Merchants Association, held at the Union League Club in Chicago, was well attended. Many matters of importance were discussed in detail and a better understanding created on various subjects of mutual interest.

Interesting papers were read by Leo P. Golisch, Whitaker Paper Company; William White, James White Paper Company; Charles W. Fisher, Blunden-Lyon Company; Harold Leahy, LaSalle Paper Company; James M. Abell, J. W. Butler Paper Company; and R. W. Campbell, J. W. Butler Paper Company.

Officers nominated and elected for the year of 1937 were: President, George A. Mueller, Midland-Zellerbach Paper Company; First Vice-President, E. A. Damhorst, Irwin Paper Company, Quincy, Ill.; Second Vice-President, H. A. Vose, Jr., Berkshire Papers, Inc.; and Treasurer, K. E. Hellstrom, Messinger Paper Company.

President J. T. Hillyer appointed a nominating committee, headed by James M. Abell, J. W. Butler Paper Company; and including C. F. Field, Field-Hamilton-Smith Company, Omaha; and Ray L. Pierce, Newhouse Paper Company, of Des Moines, Iowa, which chose the following for directors other than officers for the year 1937. E. B. Schmidt, Parker, Thomas and Tucker, Chicago, Dewey A. Hoadley, Carpenter Paper Company, Omaha and L. A. Ramaker, of Bouer Paper Company, Milwaukee.

The same nominating committee was then asked for names of candidates for National Committeemen, and the following were nominated. Fine Paper National Committeeman, J. T. Hillyer, Whitaker Paper Company; alternate, George A. Mueller, Midland-Zellerbach Paper Company. Wrapping Paper National Committeeman, Dewey A. Hoadley, Carpenter Paper Company; alternate E. A. Damhorst of Irwin Paper Company. All were elected.

Tissue Manufacturers Association

C. Alfred Wagner, Stevens & Thompson Paper Company, New York, was elected president of the Association of Manufacturers of Tissue at the general meeting held at the Waldorf on Wednesday. He succeeds Z. W. Ranck, The Crystal Tissue Company.

J. M. Conway, Hoberg Paper and Fibre Company, Green Bay, Wis., is the new vice-president, succeeding R. E. Rhoads, Scott Paper Company, Chester, Pa.

B. F. Picola, Gotham Tissue Corporation, New York, continues as treasurer.

Paper Shipping Sack Association

While it did not have an annual meeting scheduled, Paper Shipping Sack Manufacturers Association held sessions at the Waldorf.

Meetings were held both morning and afternoon while a luncheon also took place. The annual session is scheduled for September.

W. J. Dixon, St. Regis Paper Company, heads the organization with P. T. Sowden, Arkell & Smiths, Canajoharie, N. Y., as vice-president. Frank Pocta, 370 Lexington Avenue, is secretary.

Glassine and Greaseproof Association

The Glassine and Greaseproof Manufacturers Association, at its Annual Meeting today re-elected Folke Becker, of the Rhinelander Paper Company, as chairman. The other members of the Executive Committee also re-elected, were: O. Hedstrom, Hartford City Paper Company; P. E. Hodgdon, Deerfield Glassine Company; R. F. Nelson, Glassine Paper Company, and J. L. Riegel, Riegel Paper Corporation. Thomas J. Burke was re-elected secretary-treasurer.

Ward Paper Co. Incorporates

The Ward Paper Mill of Merrill, Wis., was incorporated on February 19 under the name of the Ward Paper Company. The officers of the company are J. M. Ward, president and general manager; A. M. Vanderberg, vice-president and superintendent; D. C. Everest, secretary and treasurer; Valeria D. Schaars, assistant secretary and G. H. Suhs, chief engineer.

SULPHITE

BLEACHED and UNBLEACHED

Kalix Kraft Ground Wood

RAGS • PAPER STOCK

and other

PAPER MAKING MATERIALS

Exclusive Agents for U. S. A. for

ETTLINGEN — Strong Unbleached Sulphite

KEXHOLM — Bleached and Unbleached Sulphite

KOENIGSBERG — Unbleached Sulphite

KOSTHEIM — Unbleached Sulphite

MANNHEIM — Bleached Sulphite

RAGNIT — Bleached and Unbleached Sulphite

TILSIT — Bleached and Unbleached Sulphite

Martel Catala Wires Nordiska Felts

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Rockefeller Center

630 FIFTH AVENUE, NEW YORK

COMPLETE SATISFACTION TO CUSTOMERS IS THE GOAL OF OUR SERVICE

Paper Business Active In Indiana

[FROM OUR REGULAR CORRESPONDENT]

INDIANAPOLIS, Inc., February 15, 1937—Business in the paper industry showed some definite improvement during the last week. Flood conditions in the southern part of the state are abating and in some instances business is being resumed. Most of the larger factories in the Evansville district have begun operations, if even on a restricted scale, and retail stores in most of the submerged cities are beginning operations. Naturally all paper stocks in all of these places are a total loss and will have to be replenished.

The local trade reported a good demand this week for common papers, including wrappers, and also for bags. The fact that some sizeable orders came from the flood districts shows that business is being resumed. Demand for these grades likely will continue heavy for some time. The local jobbers are receiving many orders that ordinarily would have gone to Cincinnati, Louisville and Evansville jobbers, largely because many of the trade in those cities are unable to fill orders, having suffered losses themselves.

Demand for fine paper also shows some improvement. Books, ledgers and covers are in demand and prices are being firmly held. Locally it is believed the recent advances made in the fine paper market likely will be followed by others. Demand for tissues also continues good with one local factory reporting sufficient orders to demand production for some time.

The paper box trade was much encouraged with news of the settlement of the automobile strike. The strike had begun to make serious inroads on demand for boxes from various accessory manufacturers. Box demand from the builders' hardware trade is improving steadily and it is believed this trade will consume much more material than a year ago.

Expands Paper Chemicals Division

The Paper Chemicals Division of the National Oil Products Company, manufacturers of sulphonated oils and chemical specialties has been recently reorganized and enlarged. The Division will be in charge of George Zust who has been connected with the sales activities of the company since 1927.

Perhaps the most interesting part of the recent changes is the newly erected experimental laboratory. While the former paper laboratory was complete in so far as the usual complement of paper testing equipment was concerned, the new laboratory will include a number of miniature paper making machines such as experimental beater, sheet molder, etc.

The result of this is significant in that it will enable the company to better predetermine the value of its paper mill specialties under conditions comparable to actual mill operations. It is hoped that this arrangement will speed up the development of new products and make for less actual mill trials.

The experimental laboratory will provide means of determining the best methods of application for the company's products, as well as determining modifications of formulas to meet particular mill conditions.

The research as well as the new practical testing laboratory is in charge of James Fritz, well known paper chemist.

An increasingly valuable service to the trade should result from the new expansion program. The change is in keeping not only with the steady growth of the paper industry but with the company's policy of maintaining its service and products abreast with the progress in paper making methods.

Protests Power Costs Increase

[FROM OUR REGULAR CORRESPONDENT]

ALBANY, N. Y., February 14, 1937.—William E. Westbrook, vice president and treasurer of the Algonquin Paper Company, of Ogdensburg, expressed criticism of the New Deal here this week because of its alleged failure to protect domestic newsprint by tariff. He was a witness at a hearing before the Public Service Commission which is engaged in investigating power rate agreements between producers of electric energy and manufacturing concerns. He declared that the paper company pays about $2,000 a year for energy supplied under agreement with the St. Lawrence County Utilities, Inc.

The mill, he testified, was the only one still remaining in this state devoted 100 per cent to the making of newsprint. When the plant was built in 1922 newsprint was selling for $80 a ton, while in the depths of the depression the price went to $34 a ton delivered. Delivered at Central New York State points today the price is $42, he said.

He brought out that the Algonquin plant was equipped to manufacture its own sulphite and uses only a small percentage of its capacity. The surplus would be marketable if it were not for importations from Sweden and elsewhere that enter free of tariff, he said. Mr. Westbrook testified that his concern turned out an average of seventeen tons daily though equipped to produce seventy tons daily. He protested any increase in power costs declaring such a move would make it necessary to suspend operations.

Has Anybody Here Seen Kelly?

George Kelly, for many years connected with the manufacturing division of the paper industry in New England, discontinued his affiliation with this industry some time ago, and is now the proud owner of "The Holyoke Lobster House" at the corner of Appleton and Main streets, Holyoke, Mass.

Because of his many friends, not only in paper circles but in other fields as well, it is a foregone conclusion that this, together with the geniality of George, will reflect favorably on the business of his present and popular establishment where the motto is "Service and Quality."

Paper Makers Advertising Club

Officers of the Paper Makers Advertising Club were re-elected on Monday at the annual meeting and luncheon of the organization held at the Waldorf-Astoria Hotel.

They are Orin R. Summerville, Beckett Paper Company, president; Edson S. Dunbar, Crocker-McElwain Company, vice-president; Chan H. Cooley, American Writing Paper Company, secretary, and Maurice A. Park, Marvellum Company, treasurer.

Waterproof Paper Manufacturers'

The Waterproof Paper Manufacturers' Association met on Wednesday morning when it was decided that circumstances warranted the dissolving of the association. Hence forward, therefore, there will be no Waterproof Paper Manufacturers' Association.

Paper Merchants Dinner-Party

The French Casino was again engaged for the customary dinner-party of the National Paper Trade Association, which was held on Monday night. A large audience enjoyed the two-hour musical extravaganza "French Casino Follies."

QUALITY GOES UP . . . .

AND THE COST COMES DOWN

With More Dependable

CHINA CLAY

Like the automobile industry the paper industry drives ahead to higher standards with the help of better materials and service from its sources of supply. The consistently high quality of Cyanamid's China Clays, combined with Cyanamid's expert technical cooperation and exceptionally efficient delivery service, has helped many paper manufacturers speed up and at the same time stabilize their production schedules. Cyanamid's Clays are notable for their uniformity, bright color and low grit content. Wherever your plant is located we can give you fast, reliable service on Domestic Air-Floated, Water-Washed and Coating Clays, and a complete line of English Coating or Filler Clays.

DOMESTIC CLAYS
Bulk or Paper Bags
ENGLISH CHINA CLAYS

American Cyanamid & Chemical Corporation

30 ROCKEFELLER PLAZA • NEW YORK, N. Y.

Department of Commerce and Paper Industry*

By Ernest G. Draper[1]

You executives of a great American industry, the pulp and paper industry, have accorded to me an exceptional privilege in requesting me to be with you today. You may be sure that this kindness on your part is much appreciated. As all of you know, the Department of Commerce was established to render voluntary assistance to all branches of American business.

This sounds like a large order and it is! Sometimes the questions asked us make it difficult to repress a smile. For instance, not long ago, an inquiry was received by the Department's office in Portland, Ore., from a gentleman who asked for information regarding the Australian duty on imported baby chicks two days old. Since chicks exported from any port in the United States would be well along toward maturity when they arrived in Australia, we are still wondering whether it was planned to send mother hen to sea with her nest filled with eggs!

Types of Service Available

The Department of Commerce is often referred to as one of the service arms of the Federal Government. I believe it can be said without exaggeration, however, that there are only a handful of business executives who are aware of the many different types of service that are available. The Forest Products Division of the Bureau of Foreign and Domestic Commerce is staffed by a group of experts who are thoroughly familiar with the problems of the lumber and paper industries. This unit is especially well qualified to furnish statistical and factual information which will be helpful in the solution of both domestic and foreign marketing problems.

With its network of 34 foreign offices, the Department is constantly on the lookout for information which will be useful to American business. Trade reports containing names of importing firms that might be interested in agencies for our goods, and names of business establishments that have asked where they can obtain American products are a part of the regular reporting service of our foreign offices. Tariff schedules, import quotas, exchange restrictions, commercial laws, consumer habits, transportation facilities, and shipping regulations are other phases of export selling on which data are collected. All this information is made available in publications and special reports which can be obtained either directly from Washington or by communicating with one of our 25 branch offices in the United States.

Foreign Trade

The gradual improvement in our domestic business during the last few years has been accompanied by substantial increase in our foreign trade. New opportunities in this field are appearing every day for those who appreciate the fact that goods may be sold as profitably in export markets as in domestic channels of trade.

Our foreign trade in paper and paper-base stocks during the past 15 years has made up approximately five per cent of our total foreign commerce. This ratio has held fairly constant during years of expansion as well as during years of declining trade. Naturally, so important a part of our foreign trade has been given serious consideration in the negotiation of reciprocal trade agreements. On the import side, over 90 per cent of the trade volume consists of paper-base stocks and newsprint paper. Since these products already enjoyed free entry, no further concessions were given except to bind them to the free list in our agreements with Canada and Sweden. Various other concessions on paper or paper products have also been granted—the most important being a reduction from 60 per cent to 45 per cent in the ad valorem duty on cigarette paper in the French government.

American exports of paper, paper products and paper-base stock have expanded from a low point in 1932 of approximately $18,000,000 to more than $34,000,000 in 1936. This improvement has been greatly facilitated by the concessions granted to the United States in reciprocal trade agreements. Many concessions do not come under the paper schedule proper but under the head of printed or lithographic matter. Canada gave reductions on books, advertising matter, paper roofing material, pulp board, wall paper and many other items. Our exports to Canada during the first six months of 1936 after the agreement became effective improved tremendously on some of the items listed.

Cuba also granted important concessions on paper products. During the second year of the agreement, sales to Cuba of box-boards, bristols, and writing paper increased some $380,000 as compared with the year preceding the agreement. Concessions have been received from other countries including France, Netherlands and Costa Rica. On the whole, the position of our paper exporters in foreign markets has been improved and the signing of these trade agreements has given us considerable assurance of stability of export conditions for the future.

Domestic Trade

Turning now to domestic trade, I would like to review briefly some of the services performed for those who are primarily interested in this field. One type of inquiry which comes to us at frequent intervals is the question from some small uninformed investor who asks—"How much would it cost to build and equip a small pulp and paper mill?" For the benefit of the industry and the individual investor alike, we emphasize in our reply the highly technical nature of paper making and the necessity for considerable capital and skilled personnel. This is an indirect service, it is true, but I believe you will agree that the industry is aided by the discouragement of unwise investments.

There is a wealth of statistical data which is reported regularly by our Marketing Service Division. This information can be used advantageously in the selection of trade channels, establishment of sales territories and sales quotas.

The Bureau of the Census supplements this data by a number of periodic reports covering various phases of this industry. Among these is the monthly report on paper-board manufacturing which gives the percentage of rated capacity at which the industry is operating as well as figures on new and unfilled orders. Annual tabulations are published showing the production of pulp and paper classified according to types. The wholesale trade in paper and paper products is likewise covered in a biennial report. It should be emphasized that both the Census Bureau and the Bureau of Foreign and Domestic Commerce are very desirous of cooperating with industry in

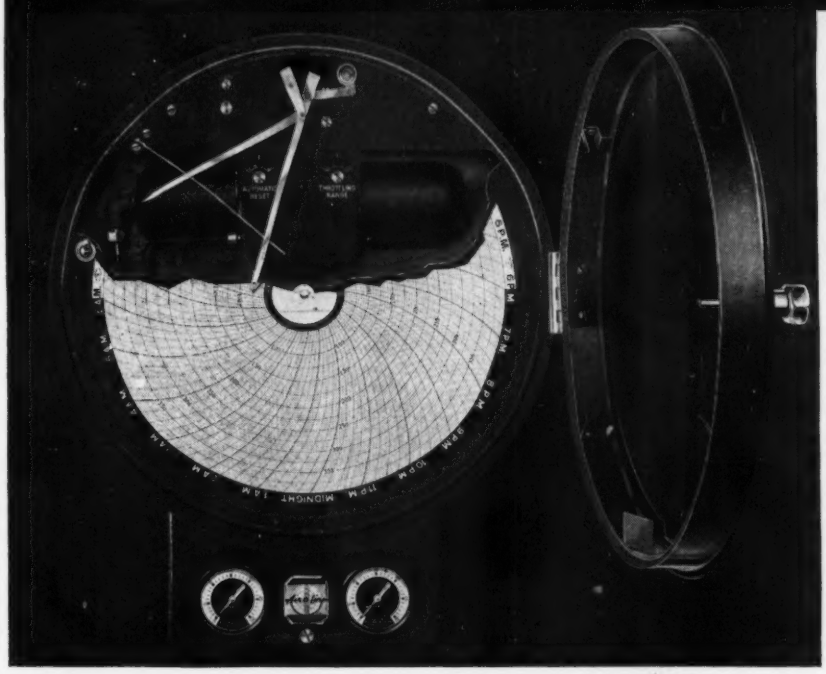
*Presented at the meeting of the Board of Governors of the American Paper and Pulp Association, February 25, 1937.

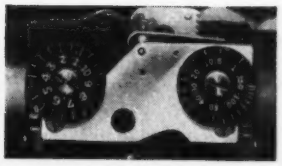
[1]Assistant Secretary of Commerce.

BROWN Air-O-Line

Simplicity has made a Hit

IT GETS RESULTS





AUTOMATIC RESET DIAL

The graduated dial makes it possible to change the rate at which the control point is automatically reset. No resistance tubing is used.

THROTTLING RANGE DIAL

Graduated from 1 per cent to 150 per cent throttling range. Sufficient to provide the flexibility required to meet any type of control problem.

Instantly adjustable without removing chart plate.

Other features and models are fully described in Catalog No. 8901. Write for it.

The ease with which Air-o-Line can be adapted to specific control requirements, Makes Air-o-Line outstanding in performance and simplicity. It has met with the entire approval of engineers wherever installed.

Air-o-Line provides an accurate and dependable means for the regulation of temperatures, pressures, flows and liquid levels.

Wherever Air-o-Line is put in charge, guesswork is eliminated, because: the Graduated Dials for both "Throttling Range and Automatic Reset" enable operators to "tune in" to specific process control. There is no need to dismantle the instrument in order to obtain "top-notch" control results. Air-o-Line is "tuned in" as easily as dialing a radio.

Air-o-Line provides additional service by automatically correcting for magnitude, rate and direction of deviation from the control setting without shifting to new positions on the throttling range.

Air-o-Line is so sensitive it instantly responds to pen movements of less than 1/10 of 1% of full scale. It will make pressure changes as minute as 0.01 lb. per sq. inch or 1/4 inch water pressure at the control valve.

Brown Air-o-Line is more than a controller—it's a system of control that will aid you to reduce costs.

Brown Air Operated Control Catalog No. 8901 fully describes the outstanding features and models. Write for a copy. THE BROWN INSTRUMENT COMPANY, *a division of Minneapolis-Honeywell Regulator Co.*, 4510 Wayne Avenue, Philadelphia, Penna. Offices in all principal cities. Canadian factory: 117 Peter Street, Toronto. European address: N.V.N. Minneapolis-Honeywell Co., Wydesteeg 4, Amsterdam-C, Holland.

BROWN AIR OPERATED CONTROLLERS

OUTSTANDING PERFORMANCE WITH SIMPLICITY

gathering statistical information which will be of value to individual manufacturers in planning their operations more intelligently.

Another unit of the Department of Commerce which offers its services to the paper industry is the Bureau of Standards. Holding the chairmanship of the committee on testing methods of the technical association in this industry, the Bureau has for years assisted in developing methods of testing and grading. There are 42 simplified practice recommendations for various paper products now in effect limiting the variety of sizes and grades. These agreements, while purely voluntary, have been reached under the auspices of this Bureau.

In the research field experiments are now being directed toward improving the lasting qualities of book paper. Is it possible, for example, to make a book from modern wood pulp which will last as long as the Gutenberg Bible? If so, how can it be done? Answers to these questions are of obvious importance not only commercially but to those interested in the preservation of our culture.

The Patent Office, another Bureau of the Department of Commerce, has served industry for more than 100 years. The present patent system, initiated in 1836, is a part of the basic structure of our business activity. Of more recent origin is the system of registering trade marks, labels, and prints, which is also operated by this Bureau. It is interesting to speculate on what the fate of modern consumer advertising methods would be if the exclusive use of trade-marked names were suddenly discontinued. This is sufficient to indicate the highly essential character of the Patent Office service.

New Type of Leadership

So much for what the Department of Commerce can do for the paper and other industries. Now, the question is—What is business going to do, not necessarily for the Department of Commerce but for the interest of the country as a whole? The country is calling upon industry for a new type of leadership. It is not satisfied with do-nothing policies nor a program of dissent. We hear this criticism on every hand.

For instance, a well-known and highly respected Senator is recently reported to have said: "When Bill So and So comes before our Committee at a hearing, we members just slump down in our chairs and prepare for the worst. Bill has been appearing before our Committee for twenty years. He has never favored any constructive legislation in whole or in part. He is always agin the government. For Bill to sponsor a piece of constructive legislation would be just as memorable in these halls of Congress as for the dome of the Capitol to totter from its foundations and crash into the street."

I am not here to argue this question at length. But for the benefit of the record, it is only fair to say that in the welter of criticism at industry, the destructive elements get all the publicity. For instance, we hear much—and rightly so—about the chiseling ten per cent of industry. Yes, but how about the law-abiding 90 per cent? It is usually the same in any problem of this character. The vicious criminal who kills and the G-men who capture him get all the headlines, while modest, hard-working John Smith can spend a lifetime in honest toil and receive no recognition whatsoever except in the hearts of a few men who know his record and respect him for it. Please do not misunderstand me, I am not condoning the criminals, either in industry or in civil life. But what I am saying is that business men are no better and no worse than any other large group of citizens who, for the most part, are believers in their country and desirous of its welfare.

We all know (and I speak now as a business man as well as a government official), that the vast majority of business executives are able, hard-working, honorable citizens. We desire to do the right thing. And, because we are human, we desire to have the general public know that we are trying to do the right thing. Just how we can be convincing in this point of view is difficult to determine. I doubt if we can do much by efforts at propaganda or mass publicity. The answer, it seems to me, must come from our daily actions rather than from our words. "By their fruits, ye shall know them." That is an ancient biblical maxim which looks as true today as two thousand years ago.

Constructive Legislation

With this in mind, there is a way along which we might proceed. It is not an all-inclusive way. Its advantage lies in the fact that it relies on actions to speak for themselves rather than words alone and high-powered propaganda. Why cannot industry throw itself wholeheartedly behind some form of constructive legislation which aims primarily at improving conditions in the country as a whole rather than just one group?

Let me be specific. Here are three measures of legislation, designed to improve different phases of our national life, which all sections of industry could afford to back with enthusiasm. And when I say "with enthusiasm" I do not mean the passage of a few perfunctory resolutions and then standing by while the legislation is cut to ribbons by selfish interests. I mean getting behind this legislation, day in and day out, until it becomes law.

First, let us outlaw, once and for all, child labor, excessively low wages and excessively long hours.

Second, let us demand that the laws of competition be clarified so that honorable business men may join together in voluntary agreements, not to fix prices nor to control production, but for the purpose of wiping out wasteful, unnecessary and unfair trade practices. If this means a revision of the anti-trust laws, let us revise them.

Third, let us enlarge the channels of international trade by supporting the continuance of the Trade Agreement Act. This Act is not a partisan measure. It is a statesmanlike proposal to revive our foreign trade in the interest of our country as a whole. We shall probably never have, in this generation, such an opportunity to improve, in a rational way, our trade relations with foreign countries and, by improving these relations, to strike a tremendous blow in favor of international peace.

I wish that I had the time to debate these issues more fully. But I hope that I have said enough to show that a real problem exists and that there is a way out. Who knows but that five or ten years from now we may be able to look back and say: "It was in 1937 that American industry altered its direction. It saw its opportunity. It grasped its rightful leadership. By its wholehearted support of constructive legislative measures designed to help its country, it showed to the world the character and integrity of its executives. It also proved the need and the necessity of industrial statesmanship in a truly American democracy."

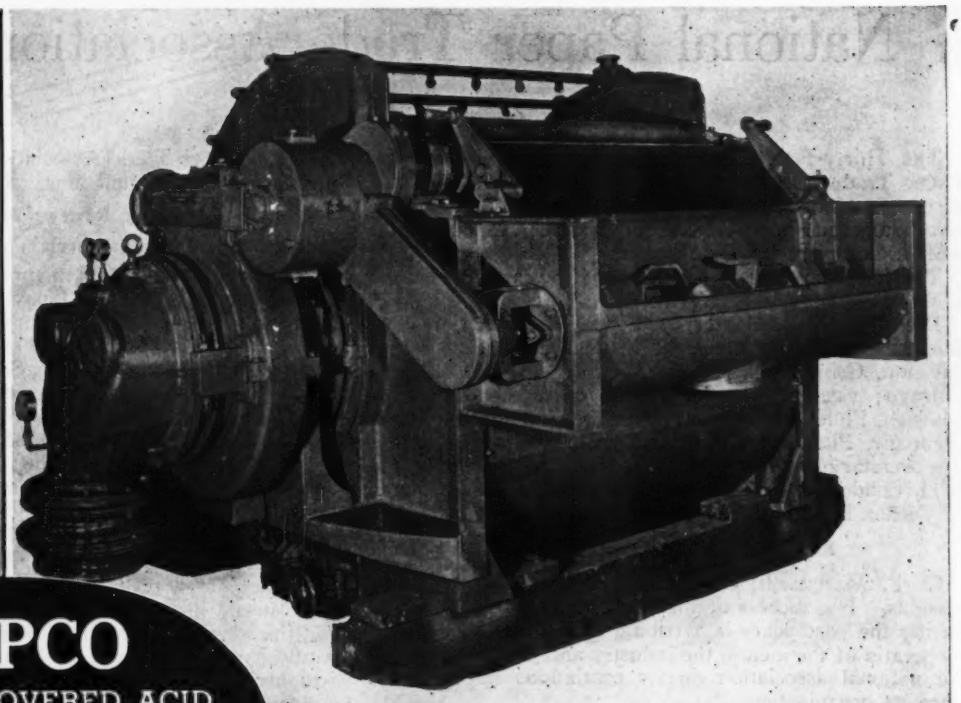
Joseph Schapiro to Head N.A.W.M.D.

A report of the Nominating Committee of the National Association of Waste Material Dealers, Inc., sent out to members last week carries the name of Joseph Schapiro of S. Schapiro & Sons, Inc., Baltimore, Md., as the nominee for the presidency of the association.

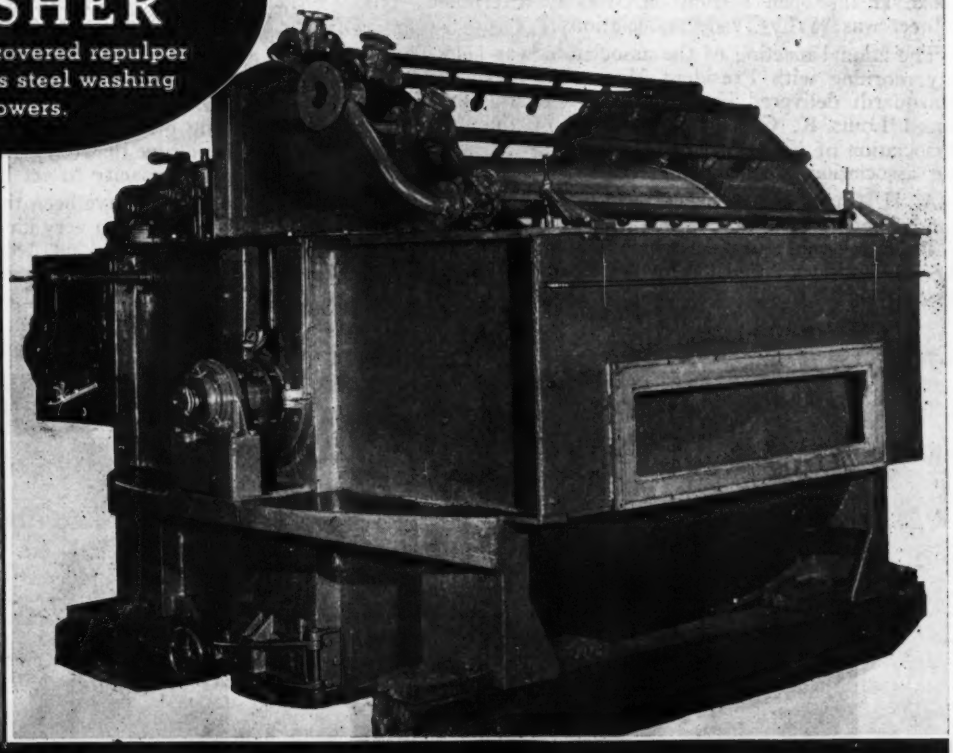
Mr. Schapiro has served the association in various capacities and for the past two years has been first vice-president of the association and president of the Associated Rag Industries, a division of the parent organization.

Members of the association will elect its officers and directors at the Annual Meeting of the association to be held in Chicago on March 17 at the final session of the three day Convention which the association is holding in that city at the Hotel Sherman, March 15 to 17 inclusive.

IMPCO



IMPCO
RUBBER COVERED ACID
WASHER
with rubber covered repulper and stainless steel washing showers.



High Density Thickeners
Pneumatic Water Filters
Pneumatic Thickeners
Pneumatic Savealls
Pneumatic Washers
Cylinder Machines
Thorne Savealls
Vacuum Washers
Vacuum Filters
Flat Screens (Dunbar Drive)
Knotters
Deckers

IMPROVED PAPER MACHINERY CORPORATION
Nashua, New Hampshire

National Paper Trade Association Meets

The Thirty-Fourth annual convention of the National Paper Trade Association of the United States was held at the Waldorf-Astoria Hotel, February 22 to 25 inclusive. Numerous important meetings were held during the week which were largely attended.

The following officers for the ensuing year were elected at the annual meeting on Thursday:

President, F. Bendel Tracy, Fort Hill Paper Company, Boston, Mass.; vice-president in charge of Fine Paper Division, George Cobean, J. W. Butler Paper Company, Chicago; vice-president in charge of Wrapping Paper Division, Finley T. Jamison, Interstate Cordage and Paper Company, Pittsburgh, Pa. A. H. Chamberlain is executive secretary of the association and C. A. Spaulding and J. H. Londergan are assistant secretaries. C. W. Vernon of Vernon Bros. & Co., New York is treasurer.

Retiring President Opens Sessions

O. F. Marquardt, the retiring president, opened the sessions. The success of the paper industry, he declared, during the past years is a tribute to the intelligence and cooperatin of the men in the industry and he complimented the national association on its continuous improvement since its organization.

Charles R. Stevenson, of Stevenson, Jordan & Harrison spoke at the open session on Monday afternoon. His subject was "Why Trade Associations?"

The annual meeting of the association was held Thursday morning with President Marquardt presiding. Mr. Marquardt delivered his annual address and then introduced Louis K. Comstock, president of the Merchants Association of New York City. J. K. Javits, counsel for the association gave an interesting and important talk.

A. H. Chamberlain, executive secretary, presented his annual report and called the attention of the members to the interesting pamphlet which was being distributed at the convention entitled "Why the National Paper Trade Association?" which contained a brief history of the National Paper Trade Association, a record of its accomplishments and its functions.

Secretary Reviews Past Ten Years

In closing, Mr. Chamberlain said in part:

"On February 22, 1937 in appearing before the National Paper Trade Association I passed the anniversary to the hour, of ten years' employment in your office. Naturally, that means a lot to me; not so much to you, I realize. But it is interesting to go back over that period, which isn't so long after all, and review what has been put out at intervals in ten years. We started with the one thousand sheet plan; then the boom in 1928 and 1929 and then we had a collapse, the long depression with its discouragements and complications, all of which had never been foreseen.

"A number have spoken to me this week about the smoothness of the convention, how easy we were getting by. The officers realized that more keenly than you. That is because a lot of the problems are behind us, but when you think back to the NRA, the organization of the Code Authority, its functions, problems, etc.—well it is almost a nightmare, and it made our conventions and our board meetings as trying business engagements as one would ever wish to go through.

"In all this period there has been no development more important than the organization of the various manufacturing divisions. Ten years ago there were not many manufacturing groups; some had setups but the work was very ineffective. But today we have closely organized manufacturing groups. What does that mean to the merchants? It means that they must cooperate with equal equipment and capacity to act in a united way.

"These ten years have been the happiest of my business life. You all have been very kind to me, most of you have been extraordinarily kind, cooperative, generous and patient. I thank you all. Let me ask that we all continue the good work of the national office."

F. BENDEL TRACY, President

A. H. CHAMBERLAIN, Secretary

SAVES 30% OR MORE IN SIZING

BEWOID

A well-proved sizing process that provides many advantages, including:

Increased Brightness of Paper
Elimination of Acid Condition
Greater Permanence to Paper
Reduction in Foaming
Improvement in Finish
More Uniform Sizing
Reductions of 25% in Rosin consumption
Reductions of over 50% in Alum

These claims have actually been proved in this country. With the high rosin market of today, these savings are very significant.

BULKLEY DUNTON PULP CO. Inc.

Agents for the AMERICAN BEWOID CO.

295 Madison Ave., New York, N. Y.

Flood Stricken Areas Recover

[FROM OUR REGULAR CORRESPONDENT]

DAYTON, Ohio, February 22, 1937—Gradually the flood-stricken section of the lower Miami Valley, including Cincinnati, is resuming normal business. The cleaning-up process, which extended to numerous paper concerns, has progressed satisfactorily.

Most of the mills in Miamisburg, Franklin, Middletown, Hamilton and Lockland, which were forced either to suspend operations, or restrict their output by reason of flood interference in the absence of electric power, have been running full time and on a good grist of orders, according to information received here.

The Dayton plants were only slightly affected. Most of the consumers of power from Dayton Power and Light Company's Miller Ford plant offered to reduce consumption if by so doing their pro rata share of current could be supplied to Cincinnati or other flood-affected areas. However, this was not generally necessary and the Dayton Power and Light Company continued to furnish power to Cincinnati plants.

The Gardner-Richardson Paper Company at Middletown and several other paper mill plants in the valley that had their own power plants, shared their production with others but crippled their own operations by so doing.

Lincoln Sales Staff Augmented

Three appointments to the sales staff of its Chicago Office, 1455 West 37th Street, are announced by The Lincoln Electric Company, Cleveland, Ohio.

The men appointed include Robert A. Wilson, architectural graduate of Cornell University 1935; George Mandula who attended Ohio State University Law School for 2½ years; and A. T. Cox, Jr., who attended Purdue University and was sales engineer for the J. D. Adams Company, Indianapolis, Ind. for three years.

These men will be associated with G. E. Tenney, manager, and J. C. Ardagh, H. M. Downing, W. B. Horton and L. W. O'Day, sales engineers of the Chicago district office.

The office is equipped with stocks of Lincoln welding electrodes and accessories, as well as various models of the new Lincoln "Shield-Arc SAE" welder which features "Dual Continuous Control," assuring the proper welding arc for every welding need.

Farewell Dinner to L. C. Conner

A farewell dinner, given by members of the Wrapping Paper Department of Blake, Moffitt & Towne, Los Angeles, marked the departure of L. C. Conner when he left to take up his new duties as sales manager of the Wrapping Paper Department at the San Francisco Division of this pioneer Pacific Coast wholesale paper concern. His appointment took effect on January 15, 1937, when Walter G. Busse, sales manager of the Wrapping Paper Department in San Francisco resigned his position to establish his own converting business. Since 1928, Conner has been assistant to R. R. Whiteman, manager of the Wrapping Paper Department of Blake, Moffitt & Towne's Los Angeles Division.

Blake, Moffitt & Towne Buy New Home

Marking a business development of first importance in the Pacific Coast paper industry, the large paper distributing company of Blake, Moffitt & Towne has just announced the purchase of a new home for its San Francisco Division. The building, with frontage on both Eighth and Brannan streets, was acquired from the National Carbon Company and the transaction involved a significant move in the city's commercial development following the opening of the San Francisco Bay Bridge.

Rolland Paper Profits Up

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., February 22, 1937—The annual report of Rolland Paper Company, Ltd., for the year ended December 31, 1936, shows net profit of $142,570, which compares with $134,312 in 1935—a gain of $8,258. The company's strong current position was maintained during the year, current assets as at December 31, 1936, having amounted to $1,193,516, including investments carried at $292,443 having a market value of $344,370, against current liabilities of $177,947. Earnings were equal to 88 cents a share on common against 74 cents for 1935.

The report states that sales volume continued to improve during 1936—the third consecutive year of expanding business. The report states further that remodelling and improvements to equipment at the St. Jerome and Mont Rolland mills effected during the past two years place the company in a satisfactory position to meet an anticipated increase in business during the current year.

Price Bros. Reorganization

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., February 22, 1937—Plans are now complete for launching of issues of short and long-term bonds by which it is hoped to raise the necessary capital for undertaking the final steps in the financial re-organization of Price Bros. & Co. The proceeds of the issues are to be used to liquidate bank loans, redeem the old first mortgage bond issue practically all of which is held by Pacona, Ltd., settle creditor claims, and so on. The company is making good progress in production and earnings. Production has been stepped up to capacity, and all the company's machines are now in operation.

American Tissue Wage Increase

[FROM OUR REGULAR CORRESPONDENT]

HOLYOKE, Mass., February 23, 1937—The American Tissue Mills, Inc., has granted a 10 per cent increase to its employees, 5 per cent retroactive to February 8 and 5 per cent effective May 1. The agreement is for one year from February 8.

D. W. Pratt Resigns

D. W. Pratt has announced his resignation as Western sales agent of the International Paper Company, effective April 1, 1937. His future plans are not being made public at the present time, but he will continue to be associated with the paper industry and definite announcement of his new connection will be made shortly.

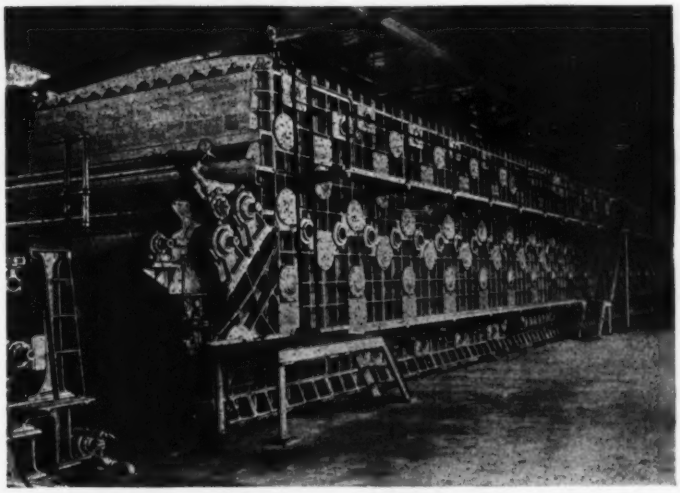
Albert B. Colby's New Post

Albert B. Colby has been elected vice-president, general manager and a director of George B. Hurd, Inc., manufacturers of fine social stationery, of 34 Hubert street, N. Y.

Kalamazoo TAPPI to Meet

The next regular meeting of the Kalamazoo Valley Section of the Technical Association of the Pulp and Paper Industry will be held March 4 at Bryant Hall, Kalamazoo.

THE MINTON VACUUM DRYER
SOLVENT SIZING



The Minton Vacuum Dryer has made Solvent Sizing commercially practical. By its use it is possible to make stronger and better paper at a *reduced Cost.*

Minton Vacuum Dried newsprint is now selling at a PREMIUM over similar paper not so dried.

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Solvent Sizing makes it possible to produce paper of a quality never before possible with a higher Mullen, higher tear, better permanence, and better sizing. It is easier to make and it is easier to sell such paper. The cost is less.

Write to us for a copy of our new booklet telling about The Minton Vacuum Dryer and Solvent Sizing.

THE MINTON VACUUM DRYER CORPORATION

Smith Building,

Greenwich, Connecticut, U. S. A.

Baldwin Observes 16th Anniversary

With a background of sales and general paper experience, plus hard work and strict attention to business, Samuel S. Himmell started the Baldwin Paper Company, Inc., sixteen years ago in the proverbial "2 x 4" office at 261 Broadway, New York, with only several so-called "open" lines.

Today, the Baldwin Paper Company, Inc., occupies an exceptionally attractive and efficient combination office and warehouse of 25,000 square feet, at 233-245 Spring street at Varick—where complete stocks of "standard Printing Papers of Quality" (the firm's slogan) are carried for immediate delivery representing sixteen consecutive years of successful progress and service.

One of the distinguishing features of Baldwin's offices is the unusual windows, on each of which is painted in facsimile colors exceptionally large trade marks of many of the mills the company represents.

Baldwin's stocks of nationally-advertised mill-brand papers are made possible through association with the following well-known mills: Martin Cantine Company, Howard Paper Company, Maxwell Paper Company, International Paper Company, Falulah Paper Company, Aetna Paper Company, Kimberly-Clark Corporation, Chemical Paper Manufacturing Company, Riegel Paper Corporation, McLaurin-Jones Company, Franklin Paper Company, Fitchburg Paper Company, American Writing Paper Company, Crocker McElwain Company, Collins Manufacturing Company, P. H. Glatfelter Company, Albemarle Paper Manufacturing Company, Geo. LaMonte & Company, C. A. Hubbard, Hollingsworth & Whitney, United States Envelope Company, as well as several specialty mills.

Baldwin's Business Brevities, the company's house organ, is published each month and is well and very favorably known throughout the metropolitan territory—in fact, inquiries for Baldwin's Brevities are received from all over the United States; as well as from many foreign countries.

Samuel S. Himmel is president and general manager; Henry Himmell vice-president and treasurer; W. F. Vallely, vice-president in charge of sales; H. Frank Smith, advertising manager and sales correspondent; and Jack J. Flaks, promotion manager—all of whom are salesmen as well as office executives. The company has a sales staff of fourteen—and carries on continuously an aggressive advertising, promotion and sales campaign—tying in effectively with the national advertising campaigns of all the mills it represents.

Ful-Lok in New Containers

As an aid to better display and more protective packaging, Continental Bag Specialties, Hudson River and 27th street, New York City, and Oneida Paper Products, Inc., 601 West 26th street, New York City, are now distributing Ful-Lok, their new two-toned, dubl-weld satchel bottom cellophane bag, in specially designed, two-colored boxes. This now affords jobbers and trade-consumers the advantage of improved protection against soilage and exposure. While it is felt that the varnish-finish on the box will help repel the action of weather and temperature elements, contents are also double-wrapped in paper which is waxed on both sides.

At the time Ful-Lok was introduced it was believed that its unique, duo-fold advantage of improved eye-appeal and increased durability at the bottom, which is produced by attaching a Tango-Gold square patch over the bottom seams of the bag, would fill a long-felt need for a cellophane bag which, at one and the same time, would offer superior attraction-value. without the aid or expense of printing, plus increased strength and ruggedness. The enthusiastic manner in which Ful-Lok has been received, though it was but recently placed on the market, apparently confirms this belief.

Ful-Lok boxes have printed on them the purposes for which Ful-Lok bags are used, the circumstances under which they are manufactured, the manner in which and the reason why the reinforced bottom stimulates sales and protects contents and instructions for their use. This is believed to be the first time that scientific packaging has been applied to a product of this nature. Ful-Lok is generally used for packaging of bulk foods, groceries, vegetables, candy, coffee, sugar, etc.

New Valley Academy Linen Bond Sample Book

Valley's newest sample book just off the press is a simple, practical, and attractive folder showing the firm's well known 50 per cent rag paper—ACADEMY LINEN BOND.

Samples of die stamped and printed letterheads, and sheets showing the four weights and four colors (blue, pink, buff and goldenrod) are included in the book which boasts an unusually good-looking cover and a modern arrangement of its title page.

Printers, engravers, lithographers and others in the trade who are interested in a low-priced, high quality bond paper can obtain the new ACADEMY LINEN BOND sample portfolio from their paper merchant or by writing to the Valley Paper Company, Holyoke, Mass.

Bantam Company Changes Name

The Bantam Ball Bearing Company, of South Bend, Indiana, has changed its name to more clearly describe its present day production. The new name is the Bantam Bearings Corporation.

When the original company was organized forty years ago the entire business was devoted to the production of ball bearings. Later Bantam pioneered in roller bearing manufacture. Since that time the acceptance of this type of bearing has grown to the point where over 90 per cent of the company's business is now devoted to the manufacture of Taper Roller and Straight Roller bearings.

Bantam Bearings Corporation is now a subsidiary of The Torrington Company of Torrington, Conn.

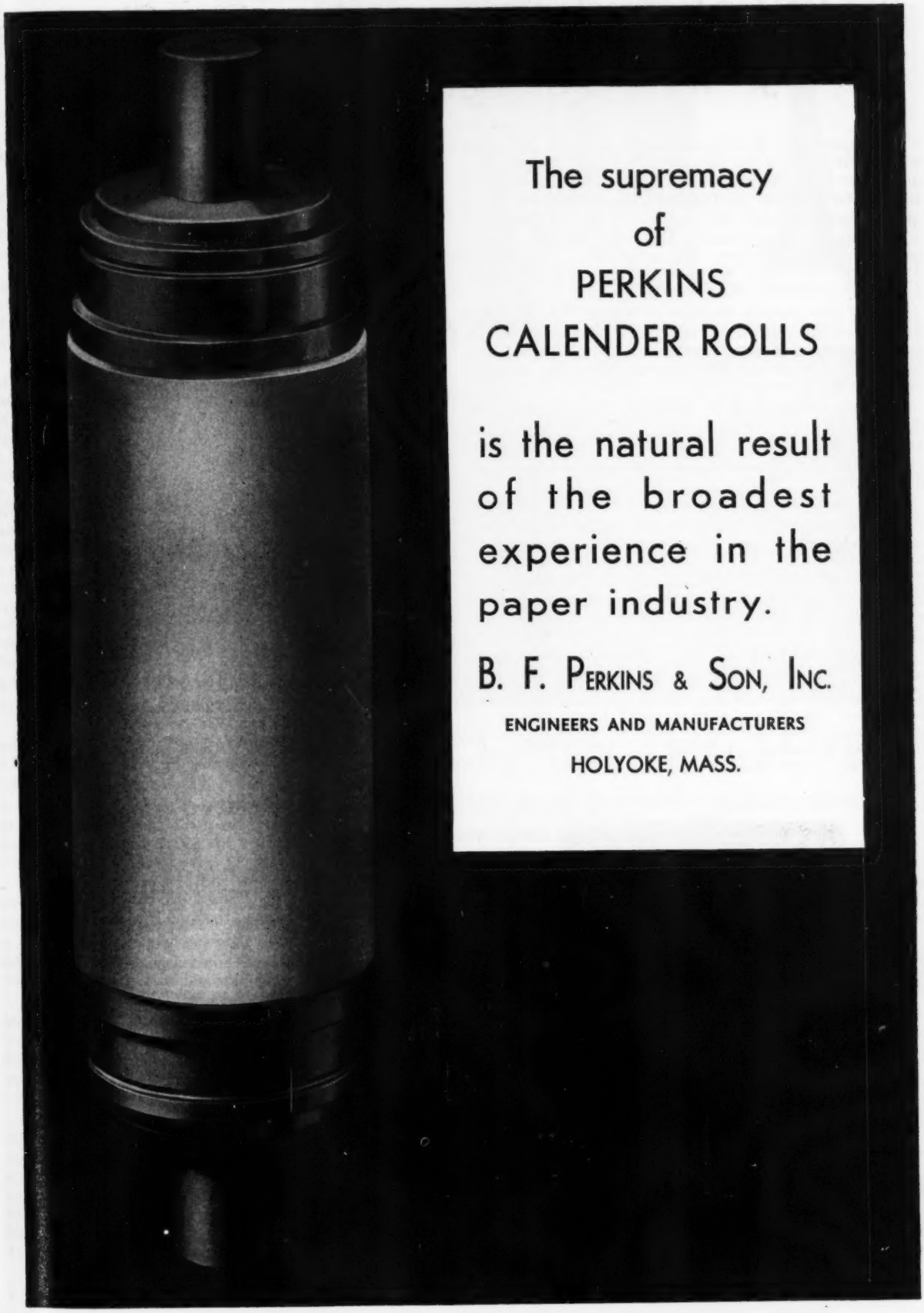
Finch Pruyn Elects Officers

[FROM OUR REGULAR CORRESPONDENT]

GLENS FALLS, N. Y., February 22, 1937—The annual meeting of stockholders of Finch, Pruyn & Co. was held last week at which officers and directors for the year were chosen. Maurice Hoopes was re-elected president; George N. Ostrander and Byron J. Lapman, vice-presidents; George N. Ostrander, secretary, and Fred B. Chapman, treasurer. The board of directors will be composed of the officers and Harold F. Bullard, Samuel Pruyn, Louis Brown and Paul Renn.

E. F. Coleman Heads Leslie Paper Co.

The Board of Directors of the F. G. Leslie Paper Company, Inc., St. Paul, Minn., announce the election of Edward F. Coleman, for twelve years secretary-treasurer of the corporation, as president and treasurer, to fill the vacancy in the office of president resulting from the death of Frederick G. Leslie.


The supremacy
of
PERKINS
CALENDER ROLLS
is the natural result
of the broadest
experience in the
paper industry.
B. F. PERKINS & SON, INC.
ENGINEERS AND MANUFACTURERS
HOLYOKE, MASS.

TAPPI Medal Is Presented to Dr. Clarence J. West For Service to Industry

Dr. Clarence J. West, prominently engaged for a long number of years in the field of bibliography for the pulp and paper industry, was awarded the medal of the Technical Association of the Pulp and Paper Industry at the annual convention of the association for his important contributions to the technical and manufacturing accomplishments of the industry. The presentation was made by Dr. Harry F. Lewis, Dean of the Institute of Paper Chemistry, Appleton, Wis., who spoke as follows:

One of the pleasant features of annual TAPPI meetings of recent years has been the tribute paid by the association to certain individuals in the pulp and paper industry who have definitely contributed to the technical progress of the industry.

In past years the TAPPI Medal has been presented by the association to William Mason, Odgen Minton, Ernst Mahler, Edwin Sutermeister, and William Millspaugh. These awards have been made for notable contributions to the chemistry or technology of pulp or paper making.

Today we meet to pay tribute to an anomaly: our medalist is a chemist, yet he has never presented a single chemical paper before TAPPI. I know that he is a chemist of considerable ability in the field of organic and bio-chemistry, and that the literature contains twenty-four scholarly contributions running all the way from "quino-carbonium salts of hydroxyxanthenols" to "the preparation of pure lecithin".

His name is known wherever periodicals on pulp or paper are read, and yet until this year he never stepped inside a paper mill. As a matter of fact, he has been a member of TAPPI for a great many years, and this is one of the few conventions of TAPPI he has attended He is a man who has served the industry loyally, effectively, and without ostentation. (I venture to say there is not a man in the room to whom his name is not a by-word and a symbol.)

DR. CLARENCE J. WEST
Awarded TAPPI Medal for Technical Research Services to the Pulp and Paper Industry

One of my pleasant privileges today will be to introduce the TAPPI medalist to his fellow co-workers in the Technical Association. I refer to the Chairman of the Committee on Abstracts and Bibliography who has held that position for seventeen years. It is an easy matter to accept the chairmanship of a committee and to coast along for several years. It is a far different thing to have been a committee chairman for seventeen years and during the entire period to have carried on so well that he is today being cited for meritorious service.

During that long period of service to TAPPI he has contributed annual bibliographies on paper making, and since 1927 has compiled annual lists of patents. He has greatly added to the literature of paper making by the publication of two large volumes of "Bibliography of Paper Making" covering the period 1900-1935. He also issued a "Bibliography of Paper Making Materials" in 1921, a revised edition of which was published in 1928.

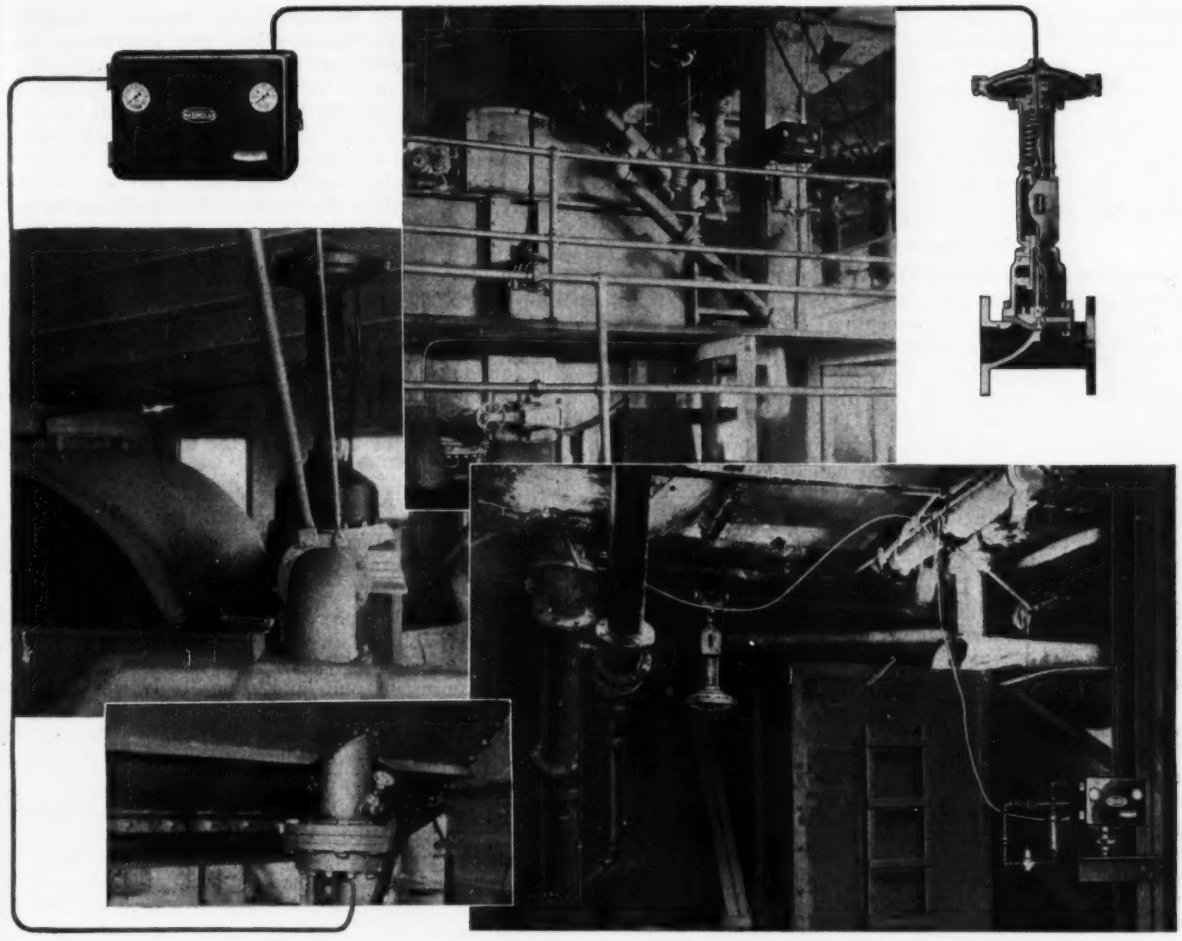
He was associated with a Committee on Classification and Definitions of Papers appointed by the National Bureau of Standards in 1921, a report of which was published in 1924, and was editor of the second report in 1928. In addition to these services for TAPPI he has been Assistant Editor for *Chemical Abstracts* since 1920, and has assisted in the compilation of many books and pamphlets for the National Research Council in connection with his work there. He has also edited the "Annual Survey of American Chemistry," ten volumes of which were published between the period 1925-1935.

Soon after the World War he wrote with Major-General Fries the first textbook on Chemical Warfare, and in collaboration with Dr. G. J. Esselen translated Heuser's notable Textbook of Cellulose Chemistry. Since he received his Ph.D. degree in 1912 he has published the almost incredible number of 550 books, articles, translations, book reviews, etc. I refer to C. J. West, TAPPI's Book of the Month author and best seller.

Librarians and bibliographers are funny people. Even more peculiar than chemists. You will recall that Johann Becher in 1669 said that chemists were a strange class of mortals, impelled by an almost insane impulse to seek their pleasure among smoke and vapor, soot and flame, poisons and poverty.

The bibliographer, on the other hand, prefers to thumb through the pages of many a dusty tome in the hopes of finding out who first conceived the idea of adding starch to a beater, or he plows through innumerable patents trying to figure out just what it was that the patentee was trying to hide from the patent office.

He appears to enjoy putting together all the references on fuzz and curl so that any Tom, Dick, or even Harry can find out what has been done and why. He goes so far in his search for the essence of an article as to read the footnotes of the articles and adds the information therein contained to the main body of knowledge which the footnote was seeking to avoid. You will often hear



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- Controlled level is easily set or changed with instrument key.
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it said that a good secretary is valuable. I say that a good bibliographer is invaluable.

Members of TAPPI and guests, it is my privilege to introduce to you my good friend and co-worker, C. J. West, "C. J." to you and to me.

Dr. West, it is both my privilege and my pleasure, on behalf of the Technical Association of the Pulp and Paper Industry, to present you with the TAPPI Gold Medal, this year's award of merit.

Dr. West's Acceptance

In accepting the medal Dr. West made the following address:

"Mr. Sutermeister, in accepting the TAPPI Medal award in 1935, began as follows:

"When I learned some time ago of the great honor which was in store for me, my first impression was that there must be some mistake. Then I found that the award was made only on the unanimous approval of the members of the Committee, so I had to give up the mistaken theory. Even though I still cannot see quite what I have done to deserve it, I do appreciate the honor very greatly and I certainly shall not refuse it because of any doubts on my part."

I then read Article IX of the Articles of Organization: "The Executive Committee may, by unanimous vote, make awards to those whose achievements have definitely contributed to the *technical progress* of the pulp and paper industry."

And finally, I read the list of men who have been thus honored by TAPPI: William H. Mason (1928), Ogden Minton (1928), Ernest Mahler (1933), Edwin Sutermeister (1935), William H. Millspaugh (1936).

I then turned to Mr. Macdonald's letter of notification and asked myself: "If Mr. Sutermeister, after 35 years of service to the industry, could not see what he had done to deserve the TAPPI Medal, why should I, who have never set foot in a pulp or paper mill, who never conducted a single laboratory experiment on any phase of the industry, even be considered as a candidate for such an honor, let alone be elected by the unanimous vote of the Committee?"

I have been thinking about this question ever since, and still I do not know the answer. But like Mr. Sutermeister, "I certainly shall not refuse it because of any doubts on my part."

I feel myself under a severe handicap in trying to address you at this time, because I really have little that I can say in response to my good friend, Harry F. Lewis. All the previous medalists have had a long list of accomplishments to their credit, any one of which would furnish a topic for a most interesting discourse.

About all I can do is to point to two or three books and say, "This is what I have done." I would not call them "Best Sellers" in any sense of the word, and yet I would not decry their value; as a matter of fact, I may say that daily I am realizing more and more just how important these books may be to any one who will use them.

Since I have been at The Institute of Paper Chemistry, I have learned that, as far as I am personally concerned, I have been building, during the past fifteen years, a reserve of information which enables me to answer, with a minimum of time and effort, the questions thrown at me by the staff of the Institute. And knowing those men, I feel sure that you will acknowledge that they are ace high as pitchers when it comes to "throwing questions."

To me, the award of this medal, while a high personal honor, is much more significant in that I am accepting it as a recognition, on the part of the Technical Association, of the value of the bibliographic and abstracting service which the Committee has rendered the Association during the past twenty years. While the scientific societies of the world have long accepted such research aids as a very necessary part of their literature, this has not been true of most technical societies.

Comparisons are usually invidious and so I will not embarrass our fellow associations and societies by pointing out the ones which make available to their members the results of research in their respective fields. But I believe I can say, in all fairness, that the Pulp and Paper Industry has been outstanding in such service, not only as to the question of abstracts, but also in that more neglected field of bibliography, which has been said to be "the foundation of research."

Even with the fear of tiring you with certain facts and figures, I hope that I may be pardoned if I recount, in brief, the history of this part of the work of the Technical Association.

In the early days the two activities, that is, abstracts and bibliography, were under two separate committees. Mr. Henry E. Surface was the first chairman of the Committee on Bibliography, and Mr. John D. Rue was first in charge of Abstracts.

The first bibliography under the auspices of the Committee was published in *Paper* for October 4, 1916, and comprised a list of "United States Government publications pertaining to pulp and paper." It was apparently Mr. Surface's idea that the Committee should prepare a number of special bibliographies, with particular reference to publications from a given laboratory, or books and pamphlets located in a given library.

Thus, he published lists from the Bureau of Standards, Forest Products Laboratory, Arthur D. Little, Inc., etc., and catalogs of the Library of Congress and the British Patent Office. That he had in mind a more ambitious program is evidenced by the following extract from his first report in 1917:

" . . . After some years, when a sufficient number of special bibliographies have been developed and when funds are available, it will then be possible to compile a general bibliography in the best and most convenient form for the use of the members of the association."

Unfortunately, Mr. Surface was killed in a train wreck on June 10, 1920, and shortly after, the writer was appointed chairman. The membership roster shows that I had just recently joined the Association. In that connection, I will always remember that our good friend and Association Secretary, Tom Keenan, raised many objections at the time my application was received, and rightly so, for the only recommendation I could offer was the fact that I was associated with Arthur D. Little, Inc., and was therefore connected with the industry. That I had published certain bibliographies in the field of pulp and paper was undoubtedly the reason why I was selected as the successor to Mr. Surface.

The Committee on Abstracts was continued as a separate project until 1923. The first abstracts, I believe, were published in *Paper* for December 26, 1917. When Dr. Rue was called to the colors in 1917, he was succeeded by Vasco E. Nunez, and still later by Ross Campbell. In the early days, this was a cooperative project with the Canadian Association, and I sometimes feel that Mr. J. N. Stephenson, now Editor of the Pulp and Paper Magazine of Canada, was the leading spirit in keeping the Committee alive. In 1923, it was felt that the work of the two committees was so closely allied that they should be united, which was done, and since that time the Com-

mittee on Abstracts and Bibliography has endeavored to follow the ever-increasing literature of the industry.

In taking over the work of the Committee, it seemed that, while special bibliographies were desirable, there should also be an annual compilation of the literature of the industry. From 1920 to 1930, inclusive, these were published in *Paper* (1920) or the PAPER TRADE JOURNAL (1921-1930). When the time came to consider the 1931 bibliography, the editor of the PAPER TRADE JOURNAL regretfully informed the secretary of TAPPI and myself that it would be impossible to carry it in the Convention number, because to do so would greatly throw out of proportion the ratio of text to advertising. Out of this adversity of the PAPER TRADE JOURNAL thus arose the issuance of the bibliography as a separate publication, in a form much more convenient than before.

Two very high compliments have been paid this aspect of the work of your Committee.

First, in 1933, the Technical Section of the Paper Makers' Association of Great Britain and Ireland decided to abandon their annual bibliography, which had been published since 1920, because they felt that the compilation of our Technical Association covered the field more adequately.

Second, in 1936 there appeared the first of what it is hoped will be an annual bibliography in the field of rubber chemistry and technology, in which Dr. D. E. Cable very generously comments on the "inestimable value" of the annual bibliographies on Paper Making and says: "These are tools that to the average paper chemist represent unfathomable economy of time and money in reaching the frontiers of technical knowledge, which is so essential in any well planned research or development undertaking before starting to chart experiments into those alluring and occasionally fortune making areas of the unknown."

The separate publication of the bibliography also enabled the Committee to include the list of United States patents, which had been compiled annually since 1926, and which, while never complete, is still believed to be of real value to the industry. The Committee has never attempted to compile lists of patents on special subjects (with the exception of the one on Waste Gases and Liquors), since this work was so admirably done for many years by Dr. Joseph Rossman.

One other activity of the Committee may be mentioned. In the reorganization of the work of the Committee on Abstracts, it seemed desirable that there be some kind of an index to the Technical Section of the PAPER TRADE JOURNAL, so that this wealth of material would be more readily accessible to research workers. Such indexes have been prepared every six months since about 1922.

It would be grossly unfair if I left you with the impression that all of the above has been the work of one individual. While it is true that I have been largely responsible for the bibliographic work of the Committee, the preparation of the abstracts has been almost entirely the work of the other members.

While I wish to acknowledge the cooperation of all who have served during the period of my chairmanship, I feel especially indebted to Mr. A. Papineau-Couture, who was a member of the Committee in 1920 and has served more than faithfully ever since. The number of abstracts signed by A.P.-C. is an indication of this fact.

Finally, there are two men who have always been of the greatest assistance in this work. The first is Mr. R. G. Macdonald, our Secretary, who often has had to act as a governor and a brake to wild ideas proposed by the Committee's chairman, but who has always been most sympathetic with the efforts proposed to improve and extend the program of work. The second is Mr. H. J. Berger, Editor of the PAPER TRADE JOURNAL, who has rendered invaluable service in the matter of the publication of the annual bibliographies.

In accepting this medal, I wish to express to the Technical Association my sincere and heartfelt thanks for its recognition of the work which the Committee on Abstracts and Bibliography has done, and which I hope it may continue to do in the future. I feel that it shows a very broad point of view on the part of the Association, for all too often such work is either taken as a matter of course, or else is ignored altogether.

T. N. Barrows Succeeds Dr. Wriston

Thomas N. Barrows, who this month succeeded Dr. Henry Merritt Wriston as director of the Institute of Paper Chemistry, Appleton, Wis., has an outstanding educational background, an extensive experience as a college executive, and the benefit of extensive travel. Elected as president of Lawrence College to succeed Dr. Wriston when he went to Brown University, Providence, R. I., as its president, Mr, Barrows automatically became director of the affiliated Institute.

President Barrows was born in San Diego, Cal., in 1900. His father, now a major-general in the United States Army, is David Prescott Barrows who formerly was president of the University of California, the school from

THOMAS N. BARROWS

which Thomas Barrows was graduated in 1922, after serving in the Navy during the World War and attending Dartmouth for one year.

From 1924 to 1931, President Barrows was a graduate student at Columbia University, serving as teacher and vice-principal of the Lincoln school, Teachers' College, in the University there, and as a lecturer in economics during the last three of those years. He then spent three years as director of Woodmere Academy, Woodmere, N. J., and came to Lawrence College at Appleton as dean in 1934.

Nine years were spent by the president in the Philippines while his father was there as a member of Theodore Roosevelt's commission under William H. Taft to study and govern the islands. In addition to trips to Europe and South America, he has crossed the Pacific ten times.

Favorite diversions are bridge, tennis and squash racquets, and golfing in the low eighties.

Technical Association Meets in New York

Grellet N. Collins, the Well Known Technicologist, Presides Over the Twenty-Second Annual Convention At Hotel Waldorf-Astoria — Reports Show Sound Financial Position and Increasing Interest In Work of Ass'n

The twenty-second annual convention of the Technical Association of the Pulp and Paper Industry was largely attended by technical men from the pulp and paper centers of the United States and Canada at the Waldorf-Astoria Hotel in New York from Monday to Thursday of this week. Grellet N. Collins, president of the association, delivered his annual address as follows:

Address of the President

You do not have to be told that there has been a general improvement in all lines of business. The paper industry has shown a general improvement in volume and prices for the last three years. This past year has been the best the industry has seen for a great many years, and in fact since 1929 in practically all its branches. With the improvement in volume and prices, most of the companies have shown an improvement in profits. The industry is gradually improving from the ills of the depression and slack business.

World Pulp Situation

Let us now survey the world pulp situation to see how it affects the industry, and in turn what effect it will have on the technical men in the industry.

The consumption per capita of pulp in nearly all civilized countries is on the increase due to the increased consumption of paper, rayon, staple fiber, artificial wool, lacquers, transparent films and thermoplastics. The unforeseen effects of a war are not considered here.

The approximate world production of wood pulp in 1934 was 19,875,000 short tons. The total world imports were approximately 5,448,000 tons and the total world exports were approximately 5,567,000 tons.

The **proposed and rumored new tonnage** for Scandinavian countries, Tasmania, Chile, Finland, Japan, Philippine Islands and Southern Rhodesia equals approximately 885,000 tons. The United States proposes 1,488,000; Canada about 200,000 and Russia 742,000 tons. This makes a grand total of about 3,315,500 tons increase.

While we do not assume any responsibility for the accuracy of these figures they came from sources which we believe are reliable. (With apologies to the banking fraternity!) Where there was a choice of figures the high figures have been taken to make this an extreme case. We know also that as some of the proposed new mills in the United States have not yet been financed, they are not assured. In spite of some probable errors in the calculations, let us carry them through to a conclusion.

To the 1934 production of wood pulp for the world of 19,875,000 short tons, add the proposed new tonnage of 3,315,500 which gives a total of 24,190,500 short tons, which we will assume will be in production by 1939.

The average annual increase in wood pulp production between the years 1925 and 1934 was about 4¼ per cent. In the last three years it has been much greater. If we assume that the increase over the next few years will be 4½ because of the increased use of pulp for rayon, staple fiber, transparent films and thermoplastics, we can predict future figures. If we increase the 1934 world figure by 4½ per cent per year up to 1938, we arrive at a figure of approximately 24,670,000 short tons. The previous figure we obtained by adding proposed increases was 24,190,500 short tons or a difference of less than 2 per cent. If my calculations and assumptions are in error as much as 50 per cent the comparative figures are most interesting on a percentage basis.

It is true that in certain branches of the paper industry, there may be too rapid expansion which will cause painful adjustments such as occurred in the newsprint industry.

If the United States increases its production by 1,500,000 tons, it means that it will maintain its position as the largest producer of pulp and paper in the world. Russia is expanding rapidly, but for at least the next five years

G. N. COLLINS, President

Blank & Stoller

R. G. MACDONALD, Secretary

W. R. MAULL, Vice President

6 MATERIALS EVERY PAPER MILL CAN USE TO ADVANTAGE

1. MAGNUS SLIME REMOVER—has an important application in removing slime growths from all paper mill machinery and all parts of the water system. The saving in labor it allows will surprise and please you. Use of this material cuts down specks in the paper. Its use is a great aid when changing colors. It quickly penetrates, softens and removes all such accretions from paper mill equipment. MAGNUS SLIME REMOVER is also a great aid to mills in keeping sand filters in good condition. Its use saves a great deal of labor and the cost of fresh sand when the beds become loaded.

2. MAGNUS FELTEX—is a material used for the breaking-in, conditioning and cleaning of paper mill felts. It immediately and completely penetrates a felt, putting it in a soft and evenly absorbent condition. It is of such a nature that it does not form insoluble precipitates to load the fibres as commonly results when soap compounds are used and there is alum or hardness in the water. It is so mild it has no destructive or weakening action upon the wool fibres as have alkaline materials. Its use permits great advantages of increased production due to less slowing down of the machine and less shutdowns for washups and for felt changing. FELTEX, applied to a new felt, eliminates the necessity for the usual breaking-in period.

3. MAGNUS BEATEX—is a chemical which promotes defibering and improves flocculation and formation in paper or board. It makes the water penetrate and open up the fibre bundles more rapidly and thoroughly. It does not affect the stock. Its use can show considerable savings in beating time and power, and power savings in jordaning.

4. MAGNUS SUCTION PRESS ROLL CLEANER—is an alkaline penetrating and dispersing agent, which has proven very effective in dissolving the bond between the particles of size, slime, etc., without either the rubber or the metallic inner shell and mechanical parts being adversely affected. It is a new synthetic material different and more effective than any of the natural products hitherto used for such work.

5. MAGNUS NO. 58—is a dispersant, glossing and anti-sticking agent for use in conjunction with starch sizes and coatings.

6. MAGNUSOL—is a new material for cleaning "frictions" without taking them apart. MAGNUSOL also solves the problem of keeping the space in and around the machines clean. It is also used to clean machines before repainting.

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We will ship any prospective purchaser one of our standard containers of any of the above six products, on trial, subject to acceptance only after performance satisfactory to the customer. This protects you absolutely and allows a practical mill test. Your inquiries are solicited on this fair offer basis.

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Write today for your copy of our Paper Mill Bulletin, which adequately describes these six Magnus Products, and their efficient use in paper mills.

MAGNUS CHEMICAL COMPANY

Manufacturers of Industrial Soaps, Cleaning Materials, Sulfonated Oils, Emulsifying Agents and Metal Working Lubricants.

24 South Avenue Garwood, N. J.

Magnus CLEANERS

will consume at home all the pulp and paper they can make. The Scandinavian countries and Finland will continue to be the principal source of supply for European countries for wood pulp. The North American continent is the logical place for pulp expansion in the immediate future. The unknown quantity is Japan, who is otday the world's largest rayon producer. This makes them largely dependent on foreign pulp and they are endeavoring to expand their own production nearer home to reduce imports.

The U. S. in Transition State

The proposed expansion of pulp and the interest shown in the South is going to have a far reaching effect. The manufacturing costs of the new mills will be lower and some of the older northern mills will be forced out of business as has already been indicated. Some of the northern mills will continue to survive because they are advantageously located; they will put in new machinery, improve their present processes, they will improve quality and decrease their costs with good management.

As money continues to accumulate in the banks and present interest rates on investments are low, the financing of new mills should become less of a problem as time goes on. Money is being attracted to the Paper Industry.

How is this transition in the industry going to affect the technical man? Engineers will be needed to design and construct the new plants and equipment. Experienced technical operators will be consulted about the best type of equipment, machinery and processes to incorporate in the new plants. High grade technical men will be needed to operate and manage the new plants to get low cost production with high quality. This applies also to the older mills if they continue to exist and operate at a profit. The technical man will be sought for control work, research and management as the industry shifts from an "art" to the "science of paper making." The development in the south is forcing the industry to be scientifically minded by the substitution of sulphate for sulphite, specially with regard to semi-bleached and full bleached pulps.

Research

The industry has had to become research conscious in a large way, having been goaded on to some extent by allied industries such as rayon, transparent films, lacquers, and cellulose compounds. The paper industry has not yet "scratched the surface" in the development of by-products. But the question arises, "How can this be accomplished?" The answer is very simple: by employing men for research. The final solution, to translate it in terms of money in the bank, however, is not so simple. It takes careful planning and years of hard work to arrive at a profitable objective. Some individual companies are well equipped to carry on their own chemical and mechanical research, but these companies are few in number. The smaller companies can do research on any scale they desire at the Institute of Paper Chemistry which is patronized by companies of all sizes. There are other very good institutions which also do work for the paper industry.

More effort and attention is being directed to mechanical research and control. Some of these developments will save appreciable amounts of power and substantially reduce the manufacturing costs.

U. S. Forest Service

The U. S. Department of Agriculture are doing a magnificent survey of the forest resources of the country having already covered an appreciable area of the country. We hope nothing will interfere with the continuation of this survey, which is most valuable not only to the Paper Industry, but the nation.

The U. S. Forest Products Laboratory at Madison are making valuable contributions. The major emphasis on their work has been the development of data which will permit planning for integrated land use.

Their research has included the study of the chemical pulping and fiber characteristics of the four major southern pines. Further studies have been made on the mechanical pulping of pine and semisulphite pulping for the production of newsprint. The work on the bleaching of southern pine sulphate pulps has progressed. Other projects such as the vapor resistance of building papers have been investigated.

The experimental paper machine has been equipped with additional control facilities, and a new experimental grinder has been installed. The Paper Industry should encourage and take full advantage of this worthy branch of the Government Service.

U. S. Bureau of Standards

Among the subjects of general interest to the paper industry which the bureau has been working on are the Development of Paper Testing Procedures, Development of Government Specifications for Paper and Paper Products, Relation of Physical Properties of Lithographic Papers to their Behavior in Offset Printing Processes, Relation of Papermaking Materials and Processes to the Quality of Book Paper for Record Purposes, and other topics.

Other U. S. Government Agencies

There are a number of other agencies doing work of interest to the industry such as the Government Printing Office, the Bureau of Chemistry and Soils, and the Bureau of Dairy Industry.

TAPPI Service to the Industry

Plans have been submitted to expand our service by the addition to our present staff of new personnel. The objective is to offer more of value to members and better serve the pulp and paper industry.

Some years ago when the association was in its infancy, we developed the idea of "Service to Members," and the value of this service has been demonstrated by interest shown in this phase of our work. Up to date over 260 special reports have been issued. It is felt that this service alone can be expanded and improved to a point which will make this the most important work of the association. When a report is originated it will be carefully studied by considering all the questions which have a bearing on that subject. The answers to the questions will be sought from various sources of information and a comprehensive report will be written.

The contents will be given particular consideration by the compiler with the objective of analyzing the information so that those receiving the report will have the latest and best information available on the subject.

A conclusion or summary will be included. This has been one of the weaknesses of our past efforts. The demand for such an improvement in the service has been growing. If selected subjects from our present list of special reports were revised and brought up to date they would be invaluable.

This work will, no doubt, overlap to some extent with the work on Monographs. The efforts can be combined in this case by the closer cooperation of the Association staff with the various committee projects and the papers can be printed much sooner than under present conditions.

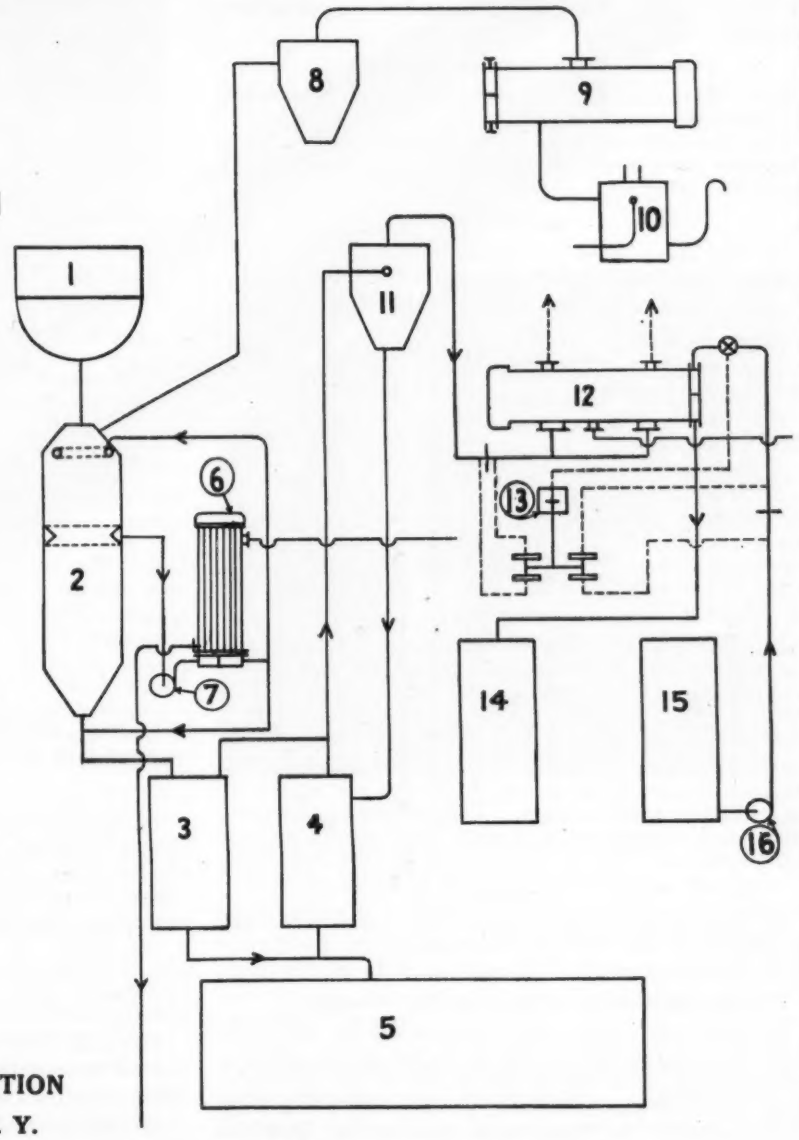
One of the ways we can improve the work of our committee organization is to provide additional assistance with

DIGESTERS

Class I welded x-rayed stress relieved

Heating—Indirect Circulating Systems
Blow-off—Heat Recovery Systems
Relief—Turpentine Recovery Systems

1. Chip Bunker
2. Digester
3. } Diffusers
4. }
5. Washed Stock Tank
6. Indirect Liquor Heater
7. Liquor Circulating Pump
8. Cyclone Separator
9. Turpentine or Relief Condenser
10. Turpentine Separator
11. Cyclone Separator
12. Surface Type Blow-Down Condenser
13. Double Differential Water Proportioning Control Valve
14. Hot Water Storage Tank
15. Cold Water Storage Tank
16. Condenser Circulating Pump



Send for descriptive bulletin

FOSTER WHEELER CORPORATION
165 Broadway, New York, N. Y.

FOSTER WHEELER

an enlarged headquarters staff. The addition to staff should help speed up the committee work.

Another ambition the association has had for a number of years is a management letter or bulletin. We have hopes that this can be developed into a monthly service which will keep executives up to date on new developments in the business.

Our Canadian friends have started a service of engineering data sheets. It is hoped we can cooperate with them to expand this service to our members.

Our TAPPI standards are growing in number and this service will be expedited by additional help from our staff.

This outline of our purpose indicates how we expect to direct our efforts.

The steady growth of TAPPI shows that we are improving with age, and the present outlook is particularly pleasing.

Report of the Secretary-Treasurer

R. G. Macdonald, secretary-treasurer of the association, presented his annual report as follows:

The year 1936 was one of considerable progress in the Technical Association, particularly in membership and in committee activities.

Membership

In 1936 there were 171 members elected, and 55 resigned or were dropped from membership. On December 31, 1936 the total membership was 1354. This is a new high record for membership.

There were 12 corporate and 17 contributing members elected. The corporate membership on December 31, 1936 was 82, and the contributing membership was 80.

The companies that became corporate members were: The Interlake Tissue Mills (Canadian), St. Regis Paper Company, Rhinelander Paper Company, Nekoosa-Edwards Paper Company, Bradner-Smith Company, The Australian Paper Mills, Ignace Spiro Sohn, (Czechoslovakia), Blandin Paper Company, Kalamazoo Vegetable Parchment Company, Chillicothe Paper Company, Central Scientific Institute of the Paper Industry (U.S.S.R.) and the Sonoco Products Company.

The companies that became contributing members were: Lindsay Wire Weaving Company, Papermakers Importing Company, Improved Paper Machinery Company, Manhattan Rubber Company, Solvay Process Company, Walworth Company, Moore and Munger Company, Mason-Neilan Regulator Company, American Wringer Company, Michigan Steel Casting Company, E. J. Cady and Company, SKF Industries, Inc., Turner-Halsey Company, Shuler and Benninghofen. Taylor Instrument Company, B. F. Perkins & Sons and General Dyestuff Corporation.

Necrology

The association sustained a loss of six members through the death of J. H. Wallace, J. G. Ramsey, A. H. Hooker Sr., J. N. Devereaux, A. J. Kennedy and C. W. Perry.

Special Reports on Manufacturing Problems

The daily mail brings many inquiries dealing with technical and other subjects relating to the paper industry, most of which are answered immediately by the Secretary, either with information on hand or obtained by him from reliable sources. In many cases, however, the questions are such that the advice of a large number in the industry is desirable. In such cases a large number of individuals, known to be qualified to furnish reliable data are circularized and their responses are included in a special report which is sent to those who responded, and to the corporate members of the association.

The special reports on manufacturing problems issued in 1936 were:

No. 250 Mechanical Handling of Bleached Pulp Furnishes.
251 Effect of Sulphite Pulping Variables on Tear.
252. Operating Suction Press Rolls on Yankee Machine.
253. Chip Screen Analysis.
254. Alloy Steel for Sulphite Mills.
255. Cutting of Casein.
256. Warping of News Board.
257. Proper Line Properties for Bleach Liquor.
258. Non-Fibrous Raw Materials Developments 1935-1936.
259. Fuzz in Newsprint.
260. Sulphite Cooking Procedure.
261. A Review of the Literature of Sizing.
262. End Curl on Patent Coated Board.
264. Supercalendering Data.
265. Gloss of Machine Glazed Kraft.
266. Paper Coating Chemical Difficulties.
267. Coating Casein Problems.
268. Machine Speed and Breaking Length of Paper.
269. Deinking of Carbonate Filled Papers.
270. Curling of Mimeograph Paper.
273. Multi-Stage Bleaching.

Employment

The association continued to render employment service to members, and aided many in obtaining employment. Companies in the pulp or paper industries, and industries serving these, are urged to seek employees such as mill managers, engineers, chemists and superintendents through the Technical Association.

Joint Summer Meeting

In August 1936 the association met jointly with the Technical Section of the Canadian Pulp and Paper Association. On August 3 papers were presented at a meeting, and a joint luncheon was held at the Mount Royal Hotel, Montreal, P. Q. From the evening of August 3 until August 7 the meetings were held aboard the S. S. Quebec. Mills were visited at Quebec, Murray Bay and Riverbend, P. Q., and at other points. About 300 participated. A report of this meeting appeared in the PAPER TRADE JOURNAL of August 13, 1936. The association is much indebted to W. S. Kidd of the E. B. Eddy Company, Hull, P. Q., and his excellent committee who handled the major details of the convention.

Publications

The PAPER TRADE JOURNAL through the courtesy of George S. Macdonald, president, and the splendid cooperation of Henry J. Berger, editor, continued to publish a section devoted to the articles and items of particular interest to association members.

The Lockwood Trade Journal Company kindly furnished the preprints used at the last annual meeting and contributed $500 toward the publication of Technical Association Papers.

Technical Association Papers was again bound in cloth and contained 600 pages, including an author and subject index.

No bibliography was published for 1935, but instead an 803 page cloth-bound volume covering the bibliography of paper making from 1928 to 1935 was prepared and sold at reduced prices to members. The bibliography for 1936 to be issued in March, 1937, will contain a list of the patents issued in 1935 and 1936.

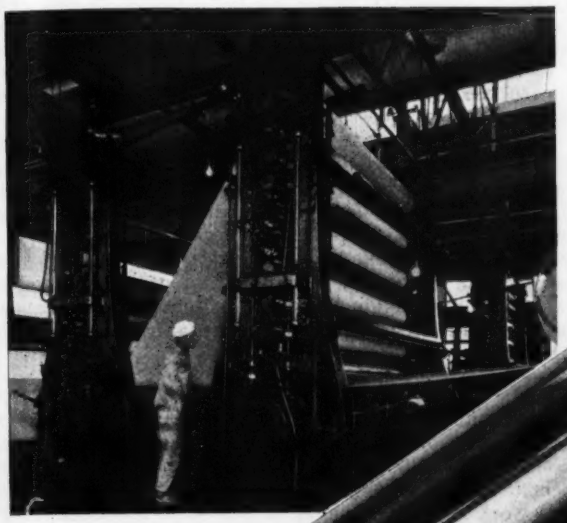
The 1936 Year Book was issued in September and

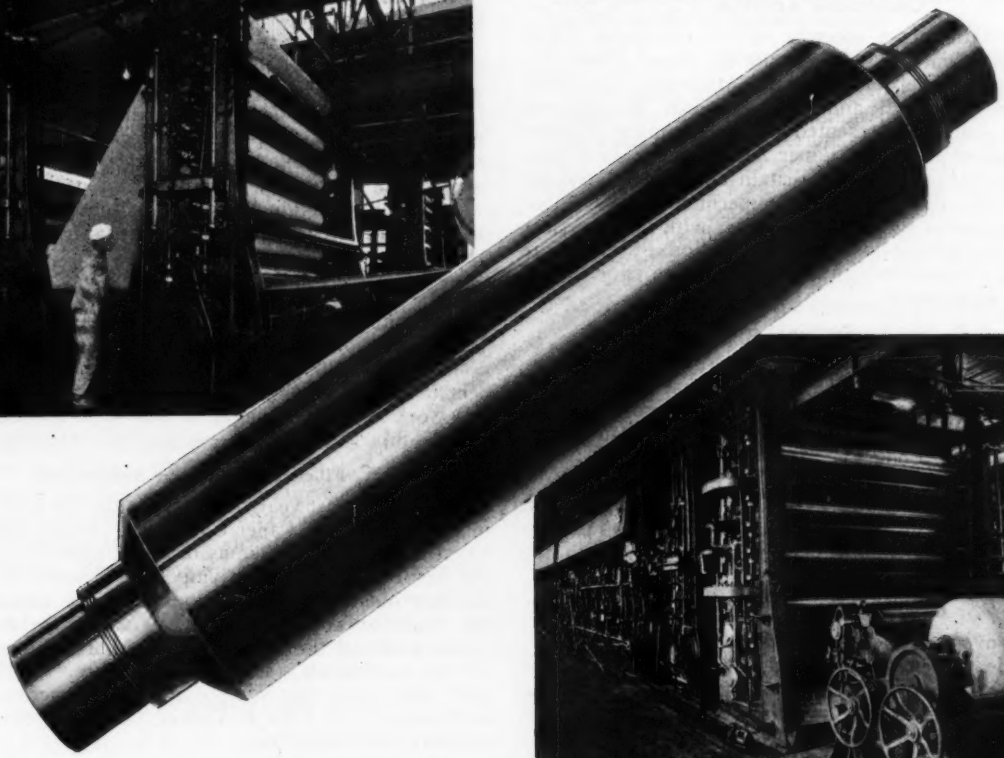
FARREL CALENDER ROLLS

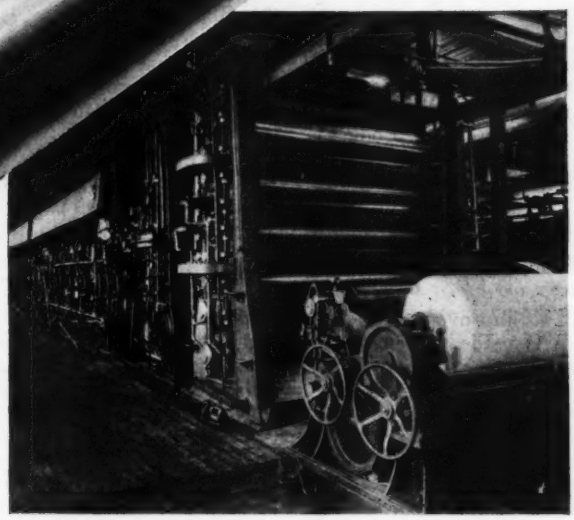
Produce Top Quality Paper

Left—"A WHOLE STACK OF ACCURACY"—168" Calender Stacks at Champion Coated Paper Co., Hamilton, Ohio, equipped with Farrel Chilled Iron Rolls.

Center—Farrel-Erler Rolls can be made 80 scleroscope and with twice the strength of ordinary chilled iron rolls.







Right—Farrel 117" Nine-Roll Calender Stack equipped with Farreloy Rolls and anti-friction roller bearings for all roll journals, in plant of Tileston & Hollingsworth Co., Boston.

The secret lies in the top-notch quality of the rolls themselves, made possible by over 75 years of experience, continuous research, unexcelled production facilities, the use of only the highest grade materials and extreme care in every step of the manufacturing process.

The superior finish and accuracy of Farrel Rolls are important factors in operating performance. The smoothness of the journal surfaces and their extreme accuracy for straightness and concentricity reduce bearing friction, create less heat and provide smoother running. Correct crown shape and amount of crown play their part in producing a sheet of uniform gauge.

The research of Farrel metallurgists has produced alloy iron rolls of improved physical characteristics, higher strength and harder body surface. They offer greater resistance to wear, do not rust or pit so quickly and retain their shape and finish longer.

To make the best paper use the best rolls . . . make sure they are Farrel Rolls . . . made in any diameter from 4" to 72" and any length of face up to 312".

FARREL-BIRMINGHAM COMPANY, INC.

50 STATE STREET, ANSONIA, CONN.

contained, in 260 pages, a list of members, and current and cumulative data on sections, medal awards, committees, special reports, standards, publications and regulations governing association activities.

The TAPPI Standards, a loose-leaf device continues to grow as more standards are added. More than 1,000 copies are in the hands of members and are obtainable by any member on request.

Many members of the association have been assisting in the preparation of the McGraw-Hill Company textbooks on "The Manufacture of Pulp and Paper, Vols. III, IV and V." These are expected to be ready at an early date.

Cooperative Activities

The association is a member of the American Paper and Pulp Association, the Institute of Paper Chemistry, the American Society for Testing Materials, the Inter-Society Color Council and the American Management Association, and is represented in the Technical Sections of the Canadian Pulp and Paper Association, The Papermakers Association of Great Britain and Ireland and the American Pulp and Paper Mill Superintendents Association. It cooperates through committees with the American Oil Chemists Association, the Association of American Wood Pulp Importers and the American Society of Mechanical Engineers.

Sections

The local sections activities have improved considerably. Many sections hold monthly meetings that attract large attendances. Complete data regarding the programs offered in 1935-36, together with a list of officers, appeared in the 1936 Year Book.

No charters for new sections were granted in 1936, but the Northern New York group has demonstrated that it can attract a large attendance at its meetings and has good leadership. It should soon be ready for recognition as a local section.

Committees and Divisions

The improvement in many of the association's committees is made evident by the excellent program arranged for this meeting. In several cases committees have been able to meet during the year and discuss their programs and projects. The new plan of designating committee projects is beginning to work out very well, and much progress can be looked for in the future.

In this report personnel changes regarding committee chairmanships will be considered. The other reports showing committee progress will appear later in Technical Association papers.

There were no changes made in the Management Division. The association became a member of the American Management Association to assist the division in its work.

There were no changes made in the Engineering Division.

In the Raw Materials Division, W. A. Chapman of Skinner & Sherman, Inc., was appointed vice-chairman and a special committee on lime specifications was appointed. This consists of John Traquair, chairman, George K. Spencer and Harold R. Murdock.

In the Operating Division, S. D. Wells of Combined Locks, Wis., succeeded G. D. Bearce of the Maine Seaboard Paper Company as chairman of the Preparation of Fibrous Materials Committee.

R. I. Wynne-Roberts of the Norton Company succeeded M. P. Chaplin of Portland, Maine, as chairman of the Mechanical Pulping Committee.

Vance P. Edwards of the International Paper Company succeeded W. H. Swanson of the Kimberly-Clark Corporation, as chairman of the Acid Pulping Committee.

George D. Bearce succeeded Frank C. Ladd of the Keith Paper Company as chairman of the Paper Manufacturing Committee; A. O. Spierling of the Hammermill Paper Company was appointed vice-chairman.

There were no changes in the Research and Development Division.

In the Testing Division, H. W. Morgan of the Institute of Paper Chemistry, succeeded R. C. Griffin of Arthur D. Little, Inc., as general chairman, and James d'A. Clark of the Scott Paper Company was appointed vice-chairman.

W. O. Hisey of the New York State College of Forestry succeeded H. W. Morgan as chairman of the Pulp Testing Committee.

In the Converting and Consuming Division the Laminating Committee was discontinued, and a new committee on paper bags was organized, with R. M. Bates of the Thomas M. Royal Company as chairman. A committee on envelopes is in the process of organizing.

The TAPPI Council, an organization made up of members of the executive committee, past presidents, division committee and section chairmen, met during the last annual meeting and discussed some of the major activities of the association.

Educational Cooperation

A committee consisting of the division chairman and John L. Parsons was authorized to expend three thousand dollars ($3,000.00) for financing research work for the benefit of the Association committees. A report covering this work appears on pages 47 and 48 in the 1936 TAPPI Year Book.

Fiber Identification Symposium

During the past year the Association has been a member of the Institute of Paper Chemistry. From June 10 to 17 about 23 members of the association, upon invitation from the Institute, attended a symposium devoted to the study of fiber identification. Part of the time was devoted to the study of improved technique under the direction of John Graff and the remainder to a thorough consideration of the association's standard procedure. A detailed report concerning this symposium and its accomplishments will be made by John B. Calkin, Chairman of the Microscopical Sub-Committee.

Concluding Comments

The association has experienced a slow but steady growth from its inception to date. It has never lacked leaders and members who were willing to give of their time and energies for its advancement. This leadership has been greatly broadened in the past few years by the growing stability of the committees and local sections. The past year, in particular, has been noted by the initiative that has been shown by chairmen in their respective services to the Association. TAPPI owes them a great deal and will be fortunate to continue to have such wholehearted and competent support.

Big Control Equipment Merger

An agreement for the acquisition of the complete line of pneumatic controls manufactured by the National Regulator Company of Chicago has been entered into between that company and Minneapolis-Honeywell Regulator Company. As a result of this acquisition by Minneapolis-Honeywell the heating, ventilating and air conditioning industry and the collaborating professions will have available from one reliable source a full range of both pneumatic and electric controls and control systems.

Practical Aspects of Recent Kraft Mill Developments*

By D. G. Moon[1]

The construction of new post depression mills in the South is naturally creating considerable interest in regard to the application of some of the more modern improvements.

Referring more particularly to the pulp mill, the main objective has been directed to more efficient recovery of chemicals and heat, development of automatic control and reduction of odors.

With a multitude of theoretical processes and equipment developments to consider, engineers have been required to select those which, while giving high economies, took the least amount of chance in experimentation, and the major improvements will be found generally to apply to—

1. Controlled cooking methods with application of circulating systems, and indirect heating with return of condensate to the boilers.
2. Recovery of heat from blow off steam and relief gases to give hot water for washing pulp and general mill use.
3. Use of highly efficient evaporator units with additional effects for higher concentrations.
4. Recovery furnace units with water cooled walls giving efficient reduction of smelt and generation of steam at high pressure from the concentrated liquors.
5. Continuous causticizing systems and lime recovery.
6. Reduction of odors, by condensing the blow off steam and relief from the digesters, and collection of vapors from other sources for elimination in the boiler furnaces.

The Power Plant

While it is realized that a power plant for a combined pulp and paper mill could possibly be designed with sufficiently high initial pressures to generate all of the required power from process and by product steam, practical application and experience seem to restrict us at present to steam generation at 450 pounds and 750 degrees, with the power generated in double extraction and condensing turbines, bleeding at 140 pounds in the first stage and 40 pounds in the second.

With such a power plant and reasonable heat recovery in the combined self-contained pulp and paper mill, it is reasonable to expect a steam consumption of from 20,000 pounds per ton for light weight wrapping grades to 15,000 pounds for board, with a corresponding power consumption of from 950 to 550 kw-hr per ton of finished product.

Modern recovery units can readily produce 10,000 pounds of steam per ton from the concentrated liquors, and 2500 pounds per ton can be obtained from bark and sawdust, thus leaving from 7500 pounds to 2500 pounds to be generated from oil or other auxiliary fuel.

The recovery furnace and refuse burning boilers can produce steam at the same pressures as the power boilers but must do so at a fairly constant rating and it is obvious therefore that all swings and fluctuations and extra demand for steam, both for process and power, must be carried on the oil burning boilers.

Steam for the Digesters

The steam used in the digesters for cooking the pulp creates the principal variation in demand, which if uncontrolled, introduces serious peak demands on the boilers with consequent loss of efficiency and high maintenance. Aside from the application of steam accumulators, this peak steam demand can be reduced somewhat through the scheduling of the cooks, by retarding the initial flow of steam to the digesters and also by cooking in the first stages with low pressure steam.

Chart No. 1 shows the theoretical rate of steam demand in proportion to the temperature rise in a 7-ton digester, based on the use of indirect heaters and circulating pumps of a size sufficient to bring the digester up to temperature of 350 degrees within 80 minutes.

Curve A indicates the steam demand that would be created with the use of 130 pound steam at the heaters with the steam valve wide open at the start of the cook and introduces a very high peak the first few minutes and a fluctuating steam demand as shown on Chart 2, the latter being based on a scheduled cycle of three cooks per hour. Irrespective of fluctuation of steam and power demand from other sources, the scheduled cooks can create a load factor on the boiler plant down to 55 per cent and if the cooks get off schedule as they are very apt to do, this load factor may even register only 30 per cent.

Curve B on Charts No. 1 and No. 2 indicates the results that can be obtained by limiting the initial flow of steam to the heaters and lengthening the time to bring the digester up to temperature by 13 per cent, from which it will be noted that with the scheduled cooks, the valleys and peaks are considerably reduced and the effect of cooking getting off schedule is not as severe.

Curve C indicates the effect of starting the cook with 30 pound steam and then changing over to 130 pound steam when the temperature of the contents of the digester approach something less than the equivalent temperature of the steam at 30-pound pressure. Under this arrangement, the initial peaks are naturally reduced, as the temperature difference between the steam at 30 pounds and the contents in the digester is much lower than it would be with 130 pound steam, and furthermore the heat transfer is about 9 per cent greater as the latent heat in condensing the steam is higher with the 30-pound steam than it is with the 130-pound steam.

Chart 2 indicates the combined demand on the boiler plant for both the 130-pound and the 30-pound steam and gives a still greater reduction in peaks and valleys than curves A or B.

The use of the lower pressure steam in the initial phase of the cook also has an advantage of generating more power on the extraction stage of the turbine, the water rate for 30-pound steam on the second extraction stage being around 22 pounds per kw-hr. as against 48 pounds on the 130-pound extraction stage. The additional power obtained amounts to about 30 kw-hr. per ton of pulp pro-

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 12-25, 1937.

[1] Member TAPPI, Chief Engineer, Union Bag and Paper Corporation, Savannah, Ga.

duced and reduces the power that is generated through the condensing stage of the turbine. With power at 5 mills per kw-hr., this would represent a saving of $30,000 a year for a 600-ton mill.

The splitting of pressures in the steaming operation is best adapted to use with indirect cooking as it is somewhat difficult to introduce 30-pound steam for a direct cook, due to limiting pipe sizes and nozzles in the ordinary digesters.

The heaters are best arranged with sufficient capacity to bring the digester up to temperature in the desired time, on the basis of a heat transfer rate of 5 Btu. per degree temperature difference per square foot of heating surface per minute, which allows for some deposit forming on the tubes. The circulating capacity should be sufficient to give at least 8 or 10 complete transfers of the liquid through the heater with a velocity through the tubes of over 7 feet per second. This velocity is essential to keep the tubes well scoured and cleaned, as deposits form rapidly and require a cleaning of the heaters every six weeks.

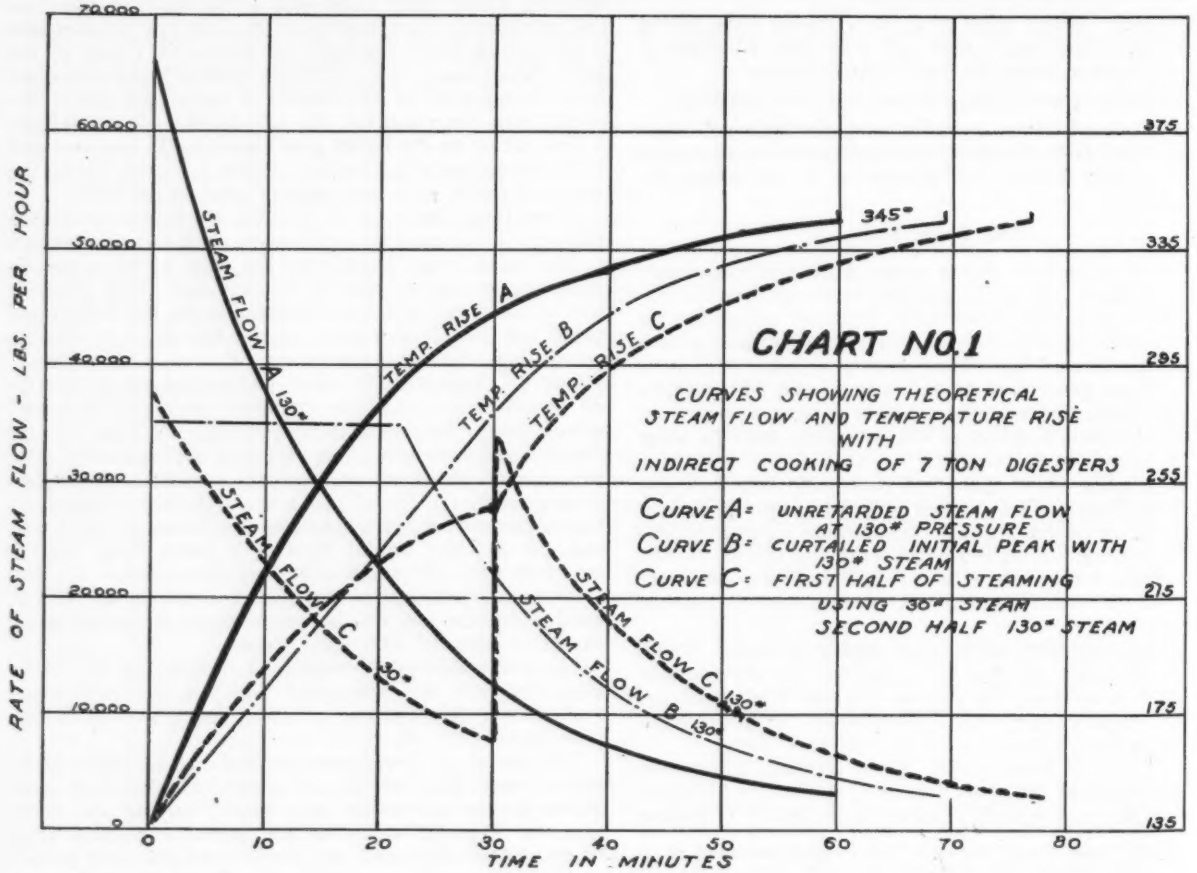
With the use of indirect heaters and circulating pumps, it is usual to anticipate some difficulty from corrosion and leakage of liquor into the condensate, therefore special alloys are required for tubes and moving parts. With the condensate from the heaters returned to the boilers, protective devices should be installed to divert the condensate, should liquor leak into it at any time. This can be done by introducing an alkalinity control element to a small quantity of the condensate bypassed from the return system, and cooling this down to a uniformly maintained temperature to assure accurate operation of the element.

The condensate from the heaters can be returned at pressure and temperature to a flash tank connecting into the hot water heater, separate lines being necessary from each heater to this flash tank in order to prevent the possibility of the higher pressure condensate from the one heater bucking the lower pressure condensate return from one of the others.

The recovery of the heat in the blow off steam has already been discussed in detail and papers presented to this group. A complete condensation of the blow-off steam can be obtained through the use of a jet condenser with automatic control of the injection water to maintain the mixture of steam and water at 190 degrees. This mixture which is of course contaminated, is stored in an accumulator and passed through two small heat exchangers, transferring its heat to clean fresh water put through at a uniform rate and thus cooling off the contaminated condensing water for re-use on a forthcoming blow.

Approximately 3,300,000 Btu. per ton of pulp are required to bring the digester and its contents up to temperature and of this approximately 2,700,000 Btu. are liberated in the blow off steam and can be recovered and used in furnishing hot water for the washing of diffusers and other mill use, to give approximately 3,000 gallons of water per ton of pulp at from 135 to 155 degrees.

If the major portion of the heat in the blow off steam is to be conserved, a close regulation is required for the injection of the condensing water. If the water should



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SCHOPPER-RIEGLER IMPROVED ORIGINAL STANDARD FREENESS (SLOWNESS) TESTER

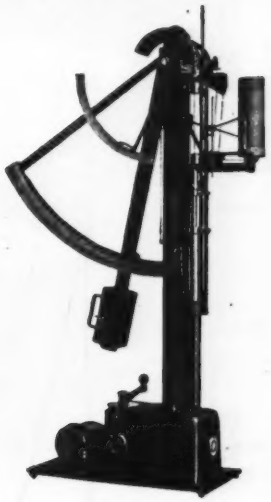
Correct readings obtained quickly from one outlet

HUMAN FACTOR FULLY ELIMINATED

SCHOPPER FOLDING ENDURANCE TESTER

TAPPI and World Standard

Equipped with new jewel bearing center folding mechanism. Millions of double folds without any noticeable wear.



SCHOPPER TENSILE STRENGTH AND STRETCH TESTERS

Electric driven with and without variable speed drive. Also hydraulic variable speed drive and hand drive.

SCHOPPER

Combined Sheet Making and Drying Machine for precision testing of pulp and paper—(One just installed at the Institute of Paper Chemistry at Appleton, Wisconsin).

This new machine has, throughout the characteristics of a small paper machine. The most essential working conditions of the paper machine being employed in making and drying the sheets. One of the essential features is the rapid operation, making a complete sheet in 4 minutes ready for tests. The sheet making apparatus alone produces 60 wet sheets per hour.

JOHNSTON

The Johnston Fibre Classifier is an apparatus for determining the distribution of fibre lengths in pulps.

Its simplicity makes it invaluable. Its completeness makes it mandatory in modern and progressive paper mills.

TESTING MACHINES, INC.

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SCHOPPER STANDARD PAPER TESTERS

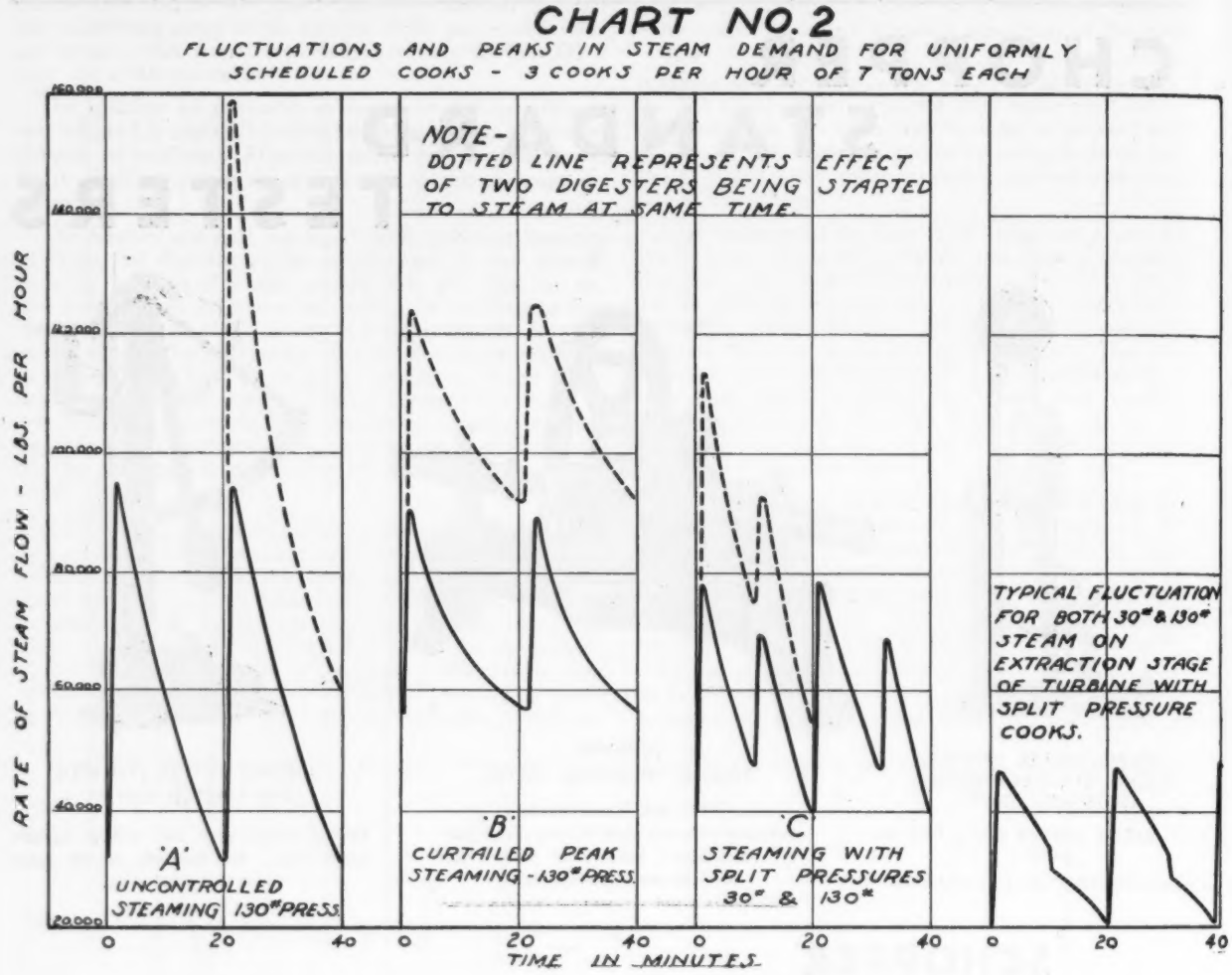


CHART NO. 2
FLUCTUATIONS AND PEAKS IN STEAM DEMAND FOR UNIFORMLY SCHEDULED COOKS - 3 COOKS PER HOUR OF 7 TONS EACH
NOTE - DOTTED LINE REPRESENTS EFFECT OF TWO DIGESTERS BEING STARTED TO STEAM AT SAME TIME.
RATE OF STEAM FLOW - LBS. PER HOUR
120,000
100,000
80,000
60,000
40,000
20,000
'A' UNCONTROLLED STEAMING 130# PRESS.
'B' CURTAILED PEAK STEAMING - 130# PRESS.
'C' STEAMING WITH SPLIT PRESSURES 30# & 130#
TYPICAL FLUCTUATION FOR BOTH 30# & 130# STEAM ON EXTRACTION STAGE OF TURBINE WITH SPLIT PRESSURE COOKS.
0 20 40 0 20 40 0 20 40 0 20 40
TIME IN MINUTES

enter the condenser too soon, it would cool down that going to the heat exchanger and if it does not come on soon enough, steam will escape to the atmosphere. The regulation of this condensing water is maintained through the medium of a butterfly valve which opens first through a pressure regulator, sensitive enough to feel the effect of the air ejection from the blow line immediately ahead of the steam and is then subsequently regulated by a temperature control in the water, leaving the jet condenser to maintain the mixture at 190 degrees.

Equivalent results can also be obtained with surface condensers if designed with means to resist corrosion and sufficient storage capacity to control the intermittent demand and supply for clean, cool water and the hot water obtained.

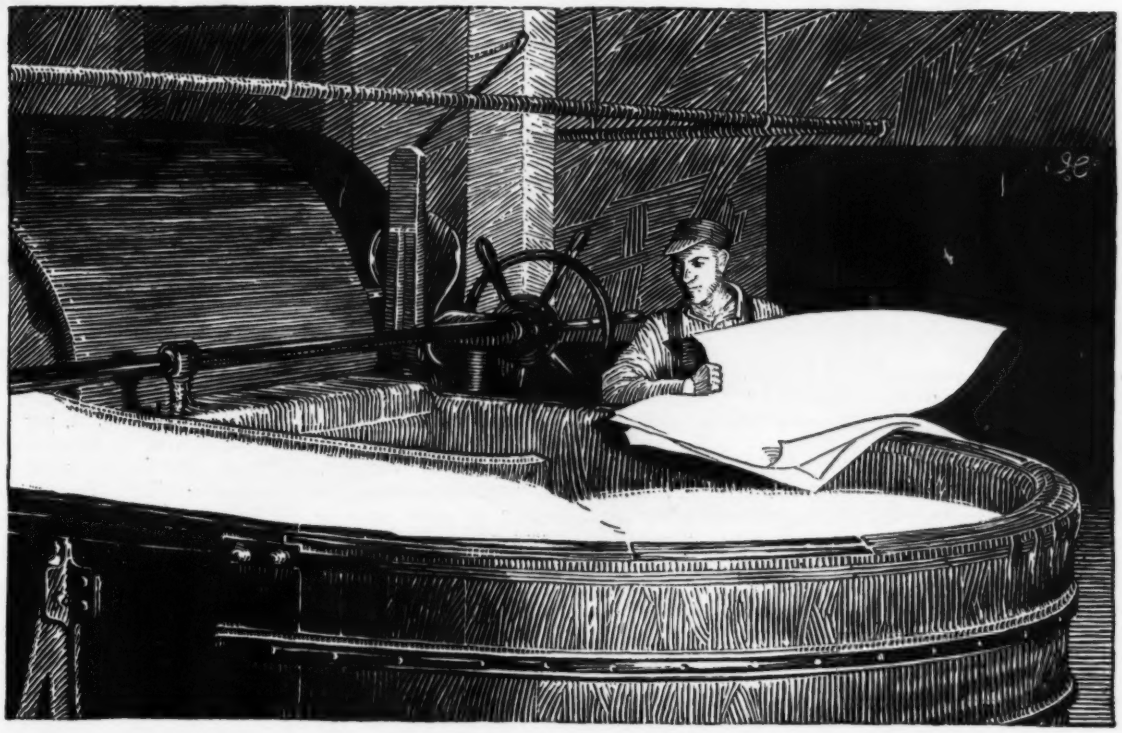
Elimination of Odors

Considerable thought has been given to the elimination of odors, and the condensing of the blow off steam has probably accomplished more than anything else in this respect. The non-condensable vapors that are given off from the storage tank of the blow-down system, as well as those from the condensate in the last effects of the evaporators and fumes from the concentrated liquor tanks and other sources, can be confined and exhausted through a fan for delivery into the air intake of the preheaters on the boilers and so consumed in the furnaces. The possibility of corrosion occurring in the piping and even ultimately in the preheaters is still to be determined and must be watched carefully.

While much has been done in the application of special alloys to counteract corrosion in the pulp mill equipment, further research is believed necessary to develop direct causes, which in many cases have not been determined definitely as to origin, whether abrasive, erosive, electrolytic hot wall action, direct corrosion or what.

The necessity for scheduling, controlling, and recording of the various operations in the modern mill is obvious, if the full benefit of refinements is to be obtained. It is one thing, however, for the engineer to lay out and calculate how an operation should be performed but it is another to actually operate, as exigencies and demand for excess production often affect the benefit of such carefully planned controls.

The use of full automatic controls in manufacturing and operation is becoming more and more into general favor. It is a wonder sometime, however, that the operator does not lay down in despair when he first sees the multitude of valves, controls, gages and gadgets that he is expected to supervise. The success of modernization is a joint responsibility resting in the ability of the technical man to convey to the practical operator the principles involved and last but not least in the abliity of the technical man to learn and obtain ideas from the operator.



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Factors Influencing Drainage Through Fourdrinier Wires*

By Harry Specht[1]

Abstract

The data in this report indicate that the rate of drainage changes with the acidity of the stuff on the wire. At a pH of approximately 5.3, all stock drainage through the wire is at a maximum.

Another fact to be gathered from the data is that while stock below pH 5.3 has a somewhat slower drainage rate, that stock at higher pH shows the most marked drainage decrease.

The difference in the rate of drainage between plain weave wire No. 6 and kraft weave wire No. 24 is increased as the temperature is decreased, indicating that No. 24 wire is less affected by the temperature change.

The relationship between plain weave wire No. 1 and kraft weave wire No. 22 is changed in a somewhat different manner with a decrease in temperature. Although the difference between the wires at any one of the three temperatures considered is not marked, that change in position which does result indicates that at the higher temperatures the No. 22 may be equivalent to, or of slightly higher drainage rate than No. 1, while at 40 degrees the kraft weave wire permits a lower drainage rate.

The rate of drainage is greatly affected by temperature. In general the drainage of the stock follows closely the viscosity curve of plain water.

With increase of temperature and pH the freeness decreases at a more rapid rate after the maximum increase has been reached.

There is a critical or maximum pH point for freeness for each type of furnish.

Wires can be correlated in regard to freeness.

The rate of drainage of the stock varies with the wire mesh.

Theories and Practice

Over a period of many years, there have been few changes made in fourdrinier wire construction. This is due, no doubt, to the limited amount of practical information with which to work, that is available to the manufacturer in designing a new type of wire.

Theories have been held and expressed in regard to the open area of wires, stock temperature and stock pH, and their influence on sheet formation and wire drainage. Recent tests indicate that machine operation does not always follow the opinions so held.

In our desire to design a new wire, every type designed seemed to conflict with these theories, if they were true to fact on the paper machine. We know that a 60-mesh wire used on news and an 80-mesh used on tissue have approximately the same open area. The 80-mesh has twice the number of openings as the 60 and so we find size of opening and number of openings affect wire drainage and sheet formation.

On a fast running news machine, tests were run with different types of wires and the following results were obtained:

A 60 x 40 round warp wire with an open area of 27.9 per cent was correct at 1200 feet per minute and not open enough at 1300 ft. per min. A 60 x 42 mesh wire with an open area of 26.4 per cent was not open enough to operate at 1150 ft. per min. A 60 x 36 mesh wire was substituted with an open area of 26.4 per cent (or equivalent to the 60 x 42 mesh from an open area standpoint) and the wire proved satisfactory at 1300 ft. per min. A 45 x 40 mesh, flat warp wire, having an open area of 22.7 per cent was too open for formation, at 1300 ft. per min., whereas a 50 x 40 flat warp wire with an open area of 20.8 per cent was just right at 1300 ft. per min. from drainage and formation standpoint. Note the great decrease in open area in the latter wires as against the former.

This test on wires with other laboratory tests on drainage and freeness of stock indicates and proves that open area as a percentage factor has no meaning in Fourdrinier operation, from a drainage standpoint.

Checking Performances

With this machine test before us, we decided to run a complete laboratory test on wires of 27 different types of construction. These tests covered drainage readings using water at 68 deg. F., and C. P. glycerine at 68 deg. F. With a Schopper-Riegler freeness tester, tests were run on the 27 wires, using standard book, bond, kraft, news, tissue and glassine furnishes. Tests were run with a standard news furnish at 40, 60 and 80 deg. F. and at pH of 4.0, 5.3, 7.1 and 7.4 respectively.

The object of this paper is to present the results of these tests and the conclusions drawn in regard to the information and data that has been collected so far.

Machine Speed as a Factor

TABLE I.—MACHINE SPEED AND WIRE LENGTH AS FACTORS IN PAPER MAKING

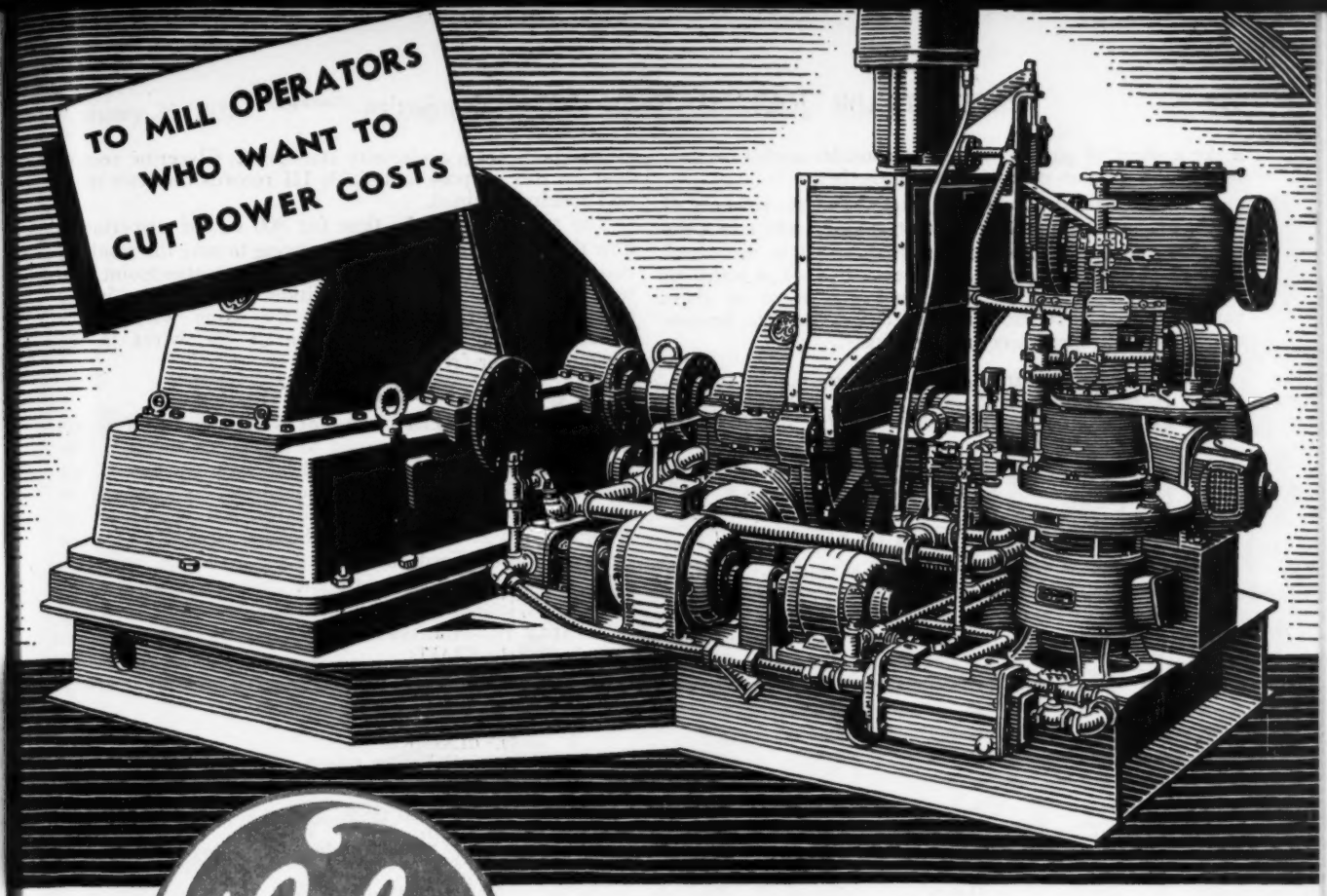
Machine Speed Feet per Min.	60 Ft. Wire: Time of travel of wire from breast roll to couch roll (27 feet) (Seconds)	60 Ft. Wire: Time of travel of wire from breast roll to first suction box (20 feet) (Seconds)	80 Ft. Wire: Time of travel of wire from breast roll to couch roll (37 feet) (Seconds)	80 Ft. Wire: Time of travel of wire from breast roll to first suction box (30 feet) (Seconds)
200	8.1	6.0	11.1	9.0
600	2.7	2.0	3.7	3.0
1000	1.6	1.2	2.2	1.8
1200	1.3	1.0	1.8	1.5

Before we present this data, we wish to consider Table I, outlining machine speed factors. At slower speeds, drainage and sheet formation are not affected by wire construction to the same degree as at higher speeds. On a 60 foot wire at 1000 f.p.m., there is an available time of 1.2 seconds for sheet formation, using the distance from the breast roll to the first suction box as the formation area. There is available 1.6 seconds for water removal using the distance from the breast roll to couch for this purpose. If an 80 foot wire is used, 50 per cent more time is available to accomplish sheet formation and 37 per cent more time is available for water removal.

By speeding the machine from 1000 to 1200 f.p.m. on a 60 foot wire, the available time for sheet formation is cut 16 per cent and 19 per cent for water removal. The available time on an 80 foot wire at 1200 f.p.m. is cut 17 per cent for formation and 18 per cent for water removal. These available periods for sheet formation are important. An increase in speed appreciably cuts the available time to

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 22-25, 1937.

[1] Secretary, Eastwood-Neally Corporation, Belleville, N. J.



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make a sheet of paper. We must consider such time factors in the relation of one speed to another.

In regard to sheet formation wire drainage, freeness of stock, pH and temperature become major factors in their relation one to the other as machine speed is increased. If we consider the making of a sheet of paper in terms of the factors of force, distance and time some of these variables, as they relate to and affect one another, become basic factors in increasing machine speed.

Types of Wire Construction Tested

The 27 wires used in these tests were of four types and are identified as follows:

Nos. 1 to 8—plain weave with round warp wire.
Nos. 9 to 12—twill weave with round warp wire.
Nos. 13 to 18—plain weave with flat warp wire.
Nos. 19 to 27—twill weave with flat warp wire.

TABLE II.—WIRE SAMPLE KEY

Wire No.	Weave	Construction	Number Openings Per Square Inch	Per cent Open Area
		ROUND WARP		
1	Plain	59 x 38	2242	26.4
2	Plain	59 x 40	2360	26.4
3	Plain	65 x 44	2860	27.4
4	Plain	70 x 48	3360	26.7
5	Plain	70 x 52	3640	26.3
6	Plain	75 x 52	3900	25.6
7	Plain	80 x 56	4480	27.2
8	Plain	80 x 60	4800	26.8
9	Twill	59 x 38	2242	26.4
10	Twill	59 x 41	2419	25.9
11	Twill	70 x 48	3360	25.4
12	Twill	70 x 52	3640	25.2
		FLAT WARP		
13	Plain	60 x 50	3000	20.8
14	Plain	60 x 56	3360	19.7
15	Plain	60 x 60	3600	19.3
16	Plain	70 x 60	4200	21.2
17	Plain	70 x 66	4620	20.5
18	Plain	70 x 72	5040	19.6
19	Twill	45 x 40	1800	22.7
20	Twill	45 x 42	1890	22.3
21	Twill	45 x 48	2160	17.1
22	Twill	50 x 40	2000	20.8
23	Twill	50 x 44	2200	20.8
24	Twill	50 x 48	2400	19.8
25	Twill	50 x 52	2600	19.1
26	Twill	60 x 60	3600	18.1
27	Twill	60 x 62	3720	17.2

Table II lists and identifies these wires by number, type of weave, mesh and open area.

Drainage tests were run using water at 68 deg. F. The results obtained were of no value, as differences in drainage were not measurable to any degree of accuracy. In results obtained later on the stock, freeness tests seemed more important, the results of these water drainage tests are therefore not presented.

Before running the stock tests, it was decided to run tests with a liquid that was free of solids, that could be easily cleaned from the wire, that was chemically stable and was suitable from a viscosity standpoint. Glycerine seemed best for this purpose and Table III records the tests made and results obtained.

TABLE III.—WIRE CLASSIFICATION USING C.P. GLYCERINE AT 68 DEG. F.

Wire No.	Drainage Time (Seconds)	Number Openings Per Square Inch	Per cent Open Area
9	17.870	2242	26.4
19	18.290	1800	22.7
10	19.475	2419	25.9
20	21.170	1890	22.3
1	21.330	2242	26.4
11	21.350	3360	25.4
22	22.440	2000	20.8
3	22.580	2860	27.4
23	22.580	2200	20.8
2	22.840	2360	26.4
12	24.246	3640	25.2
4	26.330	3360	26.7
5	27.960	3640	26.3
6	28.720	3900	25.6
24	28.790	2400	19.8
7	29.590	4480	27.2
25	29.800	2600	19.1
8	30.800	4800	26.8
26	33.450	3600	18.1
13	34.950	3000	20.8
27	35.530	3720	17.2
14	39.602	3360	19.7
16	41.720	4200	21.2
15	42.740	3600	19.3
17	45.560	4620	20.5
18	51.670	5040	19.6

The table records the time for 800 c.c. of glycerine to flow through the wire. It is interesting to note the resulting classification of the wires from a drainage standpoint, and to check the general group position of each wire in the table with relative position of the same wire in the tables recording the classification of the wires in the various stock or freeness tests.

Stock Furnishes Tested

In measuring the freeness of stock in any freeness tester, a standard wire is used to determine the comparative freeness of different furnishes. We decided to use the freeness tester with a standardized furnish and to measure the freeness of this standardized furnish with the 27 types of wire construction tabulated in Table II. Six different standardized furnishes were made up, each furnish representative of a different class of paper such as news, kraft, tissue, book, bond and glassine. See Table IV.

TABLE IV.—FURNISHES EXPRESSED IN PER CENT

1. KRAFT:
   80 Kraft unbleached
   20 Kraft broke
   2 Size
   4 Alum
   Freeness 450 cc.
2. GLASSINE:
   80 Bleached sulphite
   20 Broke
   ½ Size
   1½ Alum
   Freeness 160 cc.
3. BOND:
   80 Bleached sulphite
   20 Bond broke
   2 Size
   4 Alum
   3 Titanium dioxide
   Freeness 340 cc.
4. BOOK:
   50 Sulphite
   50 Soda
   2 Size
   4 Alum
   Freeness 330 cc.
5. GROUNDWOOD:
   80 Groundwood
   20 Sulphite
   4 Alum
   Freeness 350 cc.
6. TISSUE:
   100 Bleached sulphite
   2 Size
   4 Alum
   Freeness—No. 1, 450 cc; No. 2, 220 cc.

The preliminary tests indicated, that if normal headbox consistencies were used, the results were not highly instructive, though possibly valuable for comparative purposes. Therefore, the consistencies used were made up

TABLE V.—CLASSIFICATION OF WIRES ON NEWS FURNISH AT STOCK CONSISTENCY OF 2.585 GRAMS PER LITER.

Wire No.	Drainage Time in Seconds per 200 cc.	Wire No.	Drainage Volume Freeness (cc.)
2	4.217	19	492.5
1	4.238	1	490.0
20	4.457	20	490.0
19	4.520	2	489.0
12	4.570	12	489.0
..	4.600	11	487.5
9	4.713	22	485.0
10	4.810	3	484.0
11	4.825	21	484.0
6	4.923	10	482.5
21	4.955	9	481.5
3	5.083	23	479.0
13	5.123	5	473.5
24	5.125	24	473.5
23	5.130	6	472.5
5	5.150	4	472.0
7	5.410	7	471.5
25	5.415	13	471.5
15	5.545	14	471.0
4	5.600	25	470.0
21	5.750	15	467.5
8	5.775	8	465.0
14	5.900	16	465.0
16	6.230	17	459.0
26	6.333	27	457.5
17	6.477	18	455.0
18	6.750	26	455.0

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with stock variations of from 1.0 to 3.00 grams per liter, and the results from these tests were checked against the headbox consistency tests.

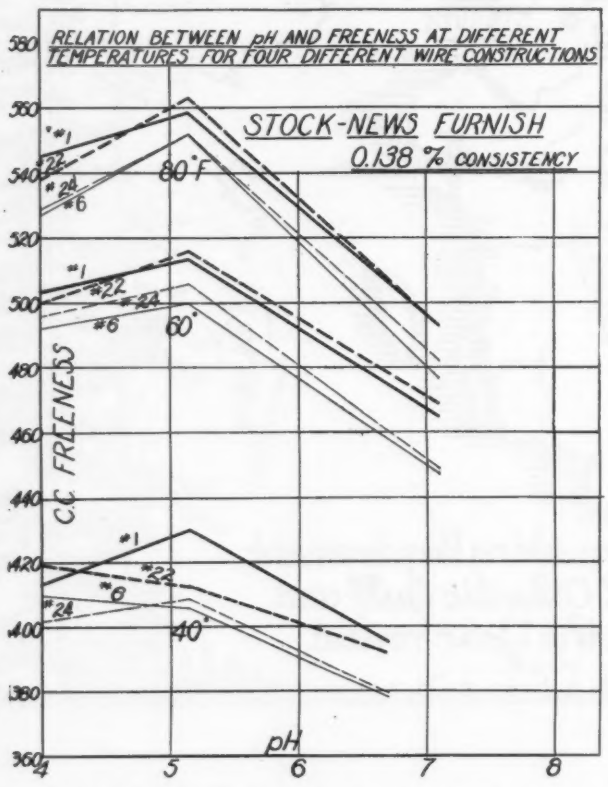
The data collected are too voluminous to present in this report, but sufficient data are presented to indicate the nature of the tests and to present the conclusions drawn. Table IV records the various furnishes used and the freeness of each furnish.

We present the results obtained on the news furnish used and Table V records the wire classifications based on this test. The tests run on the other furnishes indicate that there is a relative wire classification for each type of furnish used and this information is important when correlated with machine operation at different speeds.

The various furnishes used in these tests were made in laboratory beaters and were processed until the freeness of the stock was within the limits of mill practice. In the case of kraft and glassine, mill processed pulp was used. The procedure followed was exactly as recommended for the use of the Schopper-Riegler unit in determining the freeness of the various stock used.

The tables record drainage time and freeness. It was found that there is a definite relation between the reading indicated as drainage time and the freeness reading, but it is felt that the construction of the wire plays a greater part in the initial flow than it does in the final freeness, which is a function of the stock used.

The conclusion drawn from these tests of freeness and drainage is that the first matting of the stock on the wire determines the final freeness reading and the drainage



WIRE NO	WEAVE	REED	BEAT	NO OPENGS	% OPEN AREA
1	ROUND-PLAIN	59	38	2240	26.7
6	" "	75	52	3900	25.6
22	FLAT TWILL	50	40	2000	20.8
24	" "	50	48	2400	19.8

TABLE VI

WIRE DRAINAGE CHARACTERISTICS AT CONSTANT CONCENTRATION OF HYDROGEN IONS AND VARIED TEMPERATURE. THE FURNISH USED WAS 80% GROUNDWOOD AND 20 PER CENT UNBLEACHED SULPHITE (NO SIZE).

Wire No. 24—Mesh 50 x 48

Temperature (deg. F.)	Seconds to Drain 300 cc.	Total Drainage (cc.)
pH = 7.4		
80	11.12	483
60	12.94	450
40 (pH 6.7)	18.58	380
pH = 5.3		
80	8.27	552
60	9.67	506
40	16.13	409
pH = 4.0		
80	8.93	529
60	10.86	496
40	16.81	401

TABLE VII

WIRE DRAINAGE CHARACTERISTICS AT CONSTANT CONCENTRATION OF HYDROGEN IONS AND VARIED TEMPERATURE. THE FURNISH USED WAS 80% GROUNDWOOD AND 20 PER CENT UNBLEACHED SULPHITE (NO SIZE).

Wire No. 22—Mesh 50x40

Temperature (deg. F.)	Seconds to Drain 300 cc.	Total Drainage (cc.)
pH = 7.4		
80	9.80	495
60	10.41	470
40 (pH 6.7)	15.56	392
pH = 5.3		
80	7.01	563
60	9.08	516
40	15.08	413
pH = 4.0		
80	7.83	537
60	7.89	500
40	14.42	419

TABLE VIII

WIRE DRAINAGE CHARACTERISTICS AT CONSTANT CONCENTRATION OF HYDROGEN IONS AND VARIED TEMPERATURE. THE FURNISH USED WAS 80% GROUNDWOOD AND 20 PER CENT UNBLEACHED SULPHITE (NO SIZE).

Wire No. 6—Mesh 75 x 52

Temperature (deg. F.)	Seconds to Drain 300 cc.	Total Drainage (cc.)
pH = 7.4		
80	11.18	478
60	13.50	448
40 (pH 6.7)	19.58	379
pH = 5.3		
80	8.23	552
60	10.78	499
40	17.51	406
pH = 4.0		
80	8.87	527
60	11.38	492
40	16.74	410

TABLE IX

WIRE DRAINAGE CHARACTERISTICS AT CONSTANT CONCENTRATION OF HYDROGEN IONS AND VARIED TEMPERATURE. THE FURNISH USED WAS 80% GROUNDWOOD AND 20 PER CENT UNBLEACHED SULPHITE (NO SIZE).

Wire No. 1—Mesh 59x38

Temperature (deg. F.)	Seconds to Drain 300 cc.	Total Drainage (cc.)
pH = 7.4		
80	10.36	495
60	10.86	466
40 (pH 6.7)	15.87	396
pH = 5.3		
80	7.54	559
60	9.00	514
40	13.68	430
pH = 4.0		
80	7.56	546
60	9.56	503
40	14.71	413

factor. The same stock run at a specified freeness gives a different freeness reading and drainage reading on all of the 27 wires. From the tests run, it was also concluded that the first flow or surge from the tester represented the drainage rate for the wire, and the subsequent flow, the drainage rate of the stock.

After tabulating all the tests run of all the specified furnishes on the 27 wires, it was found that there was a definite relationship between certain wires for all furnishes. No attempt was made to determine sheet formation by means of the hand mold on the various wires but it is hoped that a continuation of this program will correlate sheet formation with these freeness tests.

Temperature and pH Influence on Drainage

The reaction of wire drainage to changes in hydrogen ion concentration and to changes in temperature was a

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value which had never been definitely determined, at least as to its effect on wire selection. Because of this fact, it was impossible to explain certain results obtained with certain groups or types of wires when these wires were run in different mills on similar or on different stocks. To follow up previous work on the classification of the various weaves and mesh of wires, with the idea of determining the effects of temperatures and pH on representative wires of different types was considered a valuable addition to that work. Consequently, the determination of the data governing these effects was undertaken along the following lines, using four different wire specimens. But one type of furnish was considered for these tests, and using the furnish data of several mills, a representative news furnish was made up, consisting of 80 per cent groundwood and 20 per cent unbleached sulphite with no rosin size.

The hydrogen ion concentrations used were, 6.7, 7.1, 7.4, 5.3 and 4.0. The temperatures were 80, 60 and 40 deg. F. The above tests were all run to indicate trends of drainage factors and more detailed data are being collected to cover the complete range of stocks and furnishes listed in Tables VI to IX covering the wire drainage characteristics at constant concentration of the hydrogen ions with various temperatures. These data are plotted in Fig. 1.

Patents Committee Developments Report 1936-37 *

By Charles W. Rivise[1], Chairman and Joseph Rossman[2], Vice-Chairman

Centennial Celebration of the American Patent System

The most important event of the year in the realm of patents was the centennial celebration of the present American Patent System which was held in Washington on November 23, 1936. The celebration was arranged by a national committee of which Charles F. Kettering was chairman and which included presidents of 19 important organizations. For a complete account of the celebration, reference is hereby made to Pages 1 and 2 of the December 10, 1936 issue of the News Edition of *Industrial and Engineering Chemistry.*

Litigation In The Paper Industry

The following decisions affecting the validity of patents in the pulp and paper industry were handed down since January 1, 1935:

(1) S. M. Langston Company v. F. X. Hooper Company, Inc., 79 Fed. Rep. (2nd) 992 (Fourth Circuit Court of Appeals).

Patents Nos. 1,850,800 and 1,850,802 covering a "running register" for printer and slotter machines were held valid.

(2) Carson v. Indiana Fibre Products Company 76 Fed. Rep. (2nd) 731 (Seventh Circuit Court of Appeals).

Patent No. 1,731,636 for a machine for making pie plates from paper was held invalid.

(3) S. M. Langston Company v. Continental Container Corporation 80 Fed. Rep. (2nd) 847 (Second Circuit Court of Appeals).

Patent No. 1,897,867 for a cutter for corrugated paper was held not infringed. The Court did not pass upon the patent's validity.

(4) Black-Clawson Company v. Centrifugal Engineering & Patents Corporation, 83 Fed. Rep. (2nd) 116 (Sixth Circuit Court of Appeals).

Patent No. 1,536,988 for a method of cleaning pulp by means of a centrifugal separator was held invalid.

(5) American Lakes Paper Company v. Nekoosa-Edwards Paper Company, 29 U. S. Patents Quarterly 551 (Seventh Circuit Court of Appeals).

Patent No. 1,517,018 for a water-marking roll for a paper machine was held invalid.

(6) Raffold Process Corporation v. Castanea Paper Company, 30 U. S. Patents Quarterly 267 (Western District of Pennsylvania).

Patents Nos. 1,803,642; 1,819,441; 1,831,928 and 1,848,659 relating to processes employed in the manufacture of paper containing an alkaline filler were held invalid.

(7) Bauer Brothers Company v. Bogalusa Paper Company, 31 U. S. Patents Quarterly 125; 16 Federal Supplement 443 (Eastern District of Louisiana).

The following patents were held invalid:

Weiss Patent No. 1,711,706 for a process of producing pulp from any kind of fibrous material.

Brennan Patent No. 1,713,593 for a feeding device for any kind of material.

(8) Process Engineers, Inc. v. Consolidated Paper Company (Eastern District of Michigan, Southern Division).

On February 15, 1936 Judge Moinet signed a consent decree sustaining Claim 3 of DeCew Patent No. 1,589,947 for sizing paper as against the defendant.

The Annual Report of The Commissioner of Patents

The annual report of the Commissioner of Patents for the fiscal year which ended June 30, 1936 reveals the following important facts:

(1) Continued improvement in industrial conditions throughout the country was reflected in a gain in the number of patent, trade-mark, print and label applications as well as in increased orders for printed copies of patents, etc.

(2) For the first time in three years the expenditures of the Patent Office exceeded its receipts. This was due in large measure to the fact that increases in compensation were give to 269 junior examiners who had served from 3 to 6 years without any increase in salary.

(3) Due to the larger number of applications filed within the year there was a slight recession in the status of the work of the Patent Office.

(4) Reclassification of patents—one of the greatest needs of the Patent Office—was greatly accelerated.

(5) Several changes in the Rules of Practice are obviating delays and facilitating procedure, particularly in interference cases.

(6) The Patent Office Advisory Committee has continued to meet regularly to consider changes in patent practice and procedure.

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 22-25, 1937.

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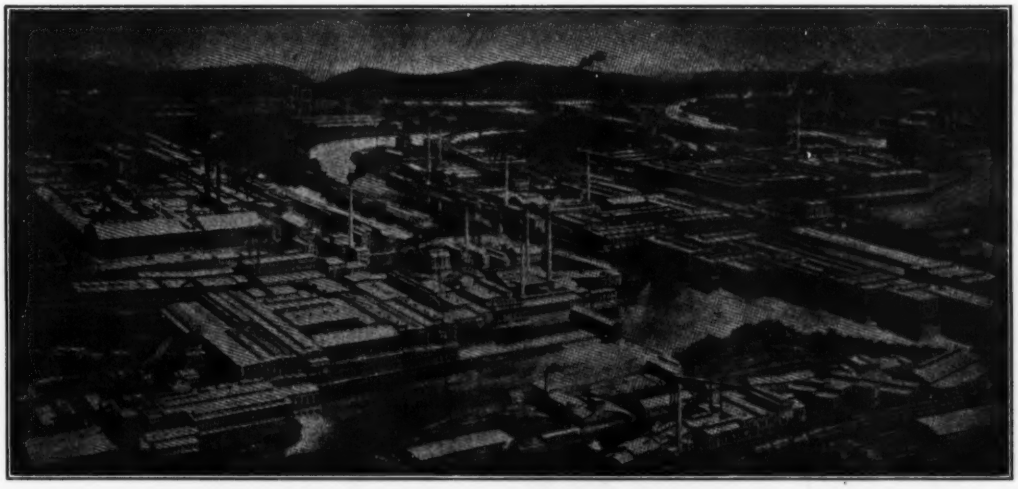

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A Summary of Fundamental Formulae for Impact and Contact Inches as Presented by Different Authors*

By Franklin M. Dietz[1]

Last year the Stuff Preparation Committee, of TAPPI collected data on various types of beaters and refiners, with the idea of showing the relation that exists between various designs of the tackle and the properties of the stuff produced. This information, it was felt, would be of great value to members.

On examination, this data showed that it would be necessary to establish a standard method of calculating formulae for impact inches and contact inches, before this data would be of value.

With this end in view, and also with the idea of developing formulae for use in the design of beating and refining equipment, G. Lamont Bidwell, Jr., and D. Manson Sutherland, Jr., presented a paper at the TAPPI Annual Meeting in February 1936, entitled, "Comparison of Impact and Contact Inches in Beaters and Refiners."

This information is given because the terms, impact inches per minute, and contact inches per minute, were first given in this article, and because this paper was the first to give a definite formula for calculating these actions in refiners, other than beaters.

In order to more clearly present the various views, "impact inches per minute," is discussed in the first part of this paper, and "contact inches per minute" in the latter part.

Impact Inches Per Minute

Mr. Bidwell and Mr. Sutherland suggested in their paper the following formula for "impact inches per minute."

$$L \times N_1 \times N_2 \times \text{R.p.m.} = \text{impact inches per minute.}$$

where L = developed length of bars in shortest member of refiner.
N_1 = number of bars in one member.
N_2 = number of bars in the other member.
R.p.m. = revolutions per minute.

The term, impact inches per minute, it is felt, was easily understood both from the definition, and from the formula. It can be explained by saying that each impact inch represents an inch of the leading edge of some bar in the rotating member of a beater or refiner, passing a corresponding inch of some bar in the stationary member.

The calculation of this length in beaters was by no means new, having been described and calculated by at least two other writers, namely, Sigard Smith and Samuel Milne.

Unfortunately, this basic length in beaters and refiners has not only been given several different names, but is calculated differently by a number of authorities on paper manufacture. This can be shown by studying some of the articles written on the subject; and the necessity of establishing a standard name and method for calculating Impact Inches is obvious.

Sigard Smith in his book called, "The Action of the Beater," published in Great Britain in 1922, clearly describes this action on page 24, 25 and 26, using the term "cutting length." He gives the following formula:—

$$\text{Cutting length} = M_v \times M_s \times L \times \frac{N}{60}$$

where L = length of face (width) of roll in meters.
M_v = number of flybars.
M_s = number of bed-plate bars.
N = number of revolutions per minute of the roll.

This formula differs from the formula for impact inches presented by Mr. Sutherland, and Mr. Bidwell in two respects: First, the length is given in meters per second, instead of inches per minute, and second, the projected length of the flybars is used, instead of the developed length.

Samuel Milne in his article, "A Study of the Beater," published in February, 1927, described this length under the term, "cutting power." He uses the following formula for his calculations:

$$N_1 \times N_2 \times L \times \text{R.p.m.} = \text{cutting power.}$$

where N_1 = number of bars in roll.
N_2 = number of bars in bed-plate.
L = length of bars in roll in inches.
R.p.m. = revolutions per minute.

Mr. Milne's formula agrees with the formula suggested for impact inches, except that Mr. Milne does not specify if the developed length, or the projected length of the roll bars is to be used.

N. A. Gray[2] of Denver, Colo., in his article, "Beater Design," written in July, 1936, uses the same name for this length as used by Dr. Sigard Smith, namely, "cutting length." His formula, although using different symbols, is also the same as given by Sigard Smith.

In the June issue of Pulp and Paper Magazine of Canada, J. B. Gough, wrote an article called "Capacity and Efficiency of Beaters and Refiners." In this article, Mr. Gough favors and accepts the formula for impact inches, but favors still another name for this length—"cutting capacity."

G. S. Witham, Sr., in his book "Modern Pulp and Paper Making," published in 1920, in his description of the beater on page 224, explains this action in beaters, but does not calculate it, simply giving the number of cuts produced by the roll bars passing the bed-plate bars for a particular size beater.

As the action produced in beaters and refiners on pulp, is generally of a rubbing and crushing nature, and only pure cutting takes place when the roll is working hard on the bed, or a jordan plug is screwed up tightly against the shell, it is felt that, impact inches per minute is the most appropriate name. The action on the fibers being mainly a succession of hammer blows or impacts.

It is also felt that the developed length of the roll bars which pass the bed-plate bars in a beater, or the developed length of the corresponding bars which pass in other refiners be used. The reason is that the length of the bar is so great in comparison to the length of the individual

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 22-25, 1937.

[1] 44 Francis Ave., Trenton, N. J.

[2] Unpublished manuscript in files of TAPPI Stuff Preparation Committee.

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fiber, that more fibers will be struck per revolution in a beater where, say, the roll is 48 inches wide, and in which the developed length of the roll bars is 54 inches, than in another beater where the roll bars are 48 inches, the same length as the roll.

Contact Inches Per Minute

D. Manson Sutherland, Jr., and G. Lamont Bidwell, Jr., also suggested in their paper the following formula for "contact inches per minute."

$$L \times N_1 \times N_2 \times W \times WF \times R.p.m. = \text{contact inches per minute.}$$

where L = developed length of bars in the shortest member of either the rotating or stationary part in inches.
N_1 = number of bars in one member.
W = width of bars in rotating member in inches.
N_2 = number of bars in other member.
WF = width factor = width of bars in stationary member in inches divided by one inch.
R.p.m. = revolutions per minute.

To most paper makers, the term "contact inches per minute," while probably hard to understand at first, was easily understood when it was explained as the area in a beater or refiner, which causes the rubbing and crushing action that takes place on the fibers.

However, it is well to mention at this time, while the rubbing and crushing action that takes place on the fibers in any beater or refiner, depend on the number of contact inches, the effectiveness of the contact inches depends on other factors, such as the width of the gap between the bars in the rotating member and the bars in the stationary member. For this reason two beaters having exactly the same number of contact inches, cannot be said to rub and crush the fibers exactly the same.

If the formula given above is studied, it will be found to give the total number of square inches of beating surface, between which pulp is rubbed and crushed, that are developed by the moving of the bars in the rotating member, past the bars in the stationary member. In each square inch as figured, a square inch of some bar in the rotating member is in contact, except for the layer of pulp that lies between the bars, with a square inch of some bar in the stationary member.

This can be illustrated by figuring the contact inches per minute in a simple beater having the following dimensions:—

Roll bars = 40 inches long (Straight bars, parallel to axis).
Number of roll bars = 40.
Width of roll bars = ½".
Bed-plate bars = 40½" Long (Staight bars, parallel to roll bars).
Number of bed-plate bars = 10.
Width of bed-plate bars = 1 inch—width factor, therefore = 1.
Speed = 400 r.p.m.

The area of the bars in the roll is equal to 40 inches (length) x ½ inch (width) x 40 (number of bars) = 800 square inches. Next the area of the bars that actually are in contact in one revolution of the roll, with 1 inch width of bed-plate bars is calculated. For the beater illustrated, this represents one bar. As the 800 square inches of the roll bars pass over the 1 inch width of the bed-plate bar, 800 square inches have come in contact, except for the small layer of pulp which naturally separates them. As the roll bars must pass over not only the first bed-plate bar, or 1 inch width of bed-plate bars, but 10 bed-plate bars, 800 square inches x 10, or 8000 square inches have come in contact. This 8000 square inches multiplied by the number of revolutions per minute will give the contact inches per minute or 8000 square inches x 400 (r.p.m.) = 3,200,000 square inches.

Samuel Milne in his article, "A Study of the Beater", calculated these same contact inches per minute, under the name of "wet beating", back in 1927.

He very cleverly proves his method of calculation to be correct by considering all the bars in the roll to be placed side by side to make a solid roll, which in the case of the simple beater figured, would be a roll with a circumference of 40 x ½ or 20 inches. He then joins all the bed-plate bars together to make a solid bed-plate, which for the beater illustrated, would be 10 inches x 1, or 10 inches wide.

If 1 inch of the solid bed-plate is now moved one complete revolution around the solid roll, it shall have come in contact with each of the 20 inches of the solid roll. Since each 1 inch width of the bed-plate gives 20 inches and the solid bed-plate is 10 inches wide, Mr. Milne would obtain 20 x 10 or 200 inches. As the roll bars are 40 inches long and the roll runs at 400 r.p.m., these must be multiplied by the 200 inches giving a total of 3,200,000 square inches as the wet beating effect which is the same as the contact inches per minute figured above.

It should be noted, however, that Mr. Milne while using the width of the solid bed-plate in inches in his calculation is actually using a width factor, because he does not obtain square inches when multiplying the circumference of the solid roll in inches by the width of the solid bed-plate in inches, the width factor being the width of the solid roll bars divided by 1 inch.

Sigard Smith early realized the necessity of calculating the area in beaters to which we owe the action of rubbing and crushing out of fibres, and in 1922 in his book "The Action of the Beater", calculated an area which he called "wet beating". In his formula, however, he does not calculate the area of the beating surface, but the linear contact area of the bars. As the rubbing and crushing of the fibers in a beater or refiner are produced by the thickness of the bars, and not by the edges of the bars, the linear contact area of the bars is not considered important.

Sigard Smith's formula is as follows:

$$\text{Beating surface per second of beaters} = M_s \times M_r \times L \times \frac{N}{60} \times (S_s + S_r)$$

where M_r = number of flybars in roll.
M_s = number of bed-plate bars.
L = width of roll in meters.
N = number of revolutions per minute of the roll.
S_s = thickness of the bed-plate bars in meters.
S_r = thickness of the flybars in meters.

The difference between this formula, and the formula suggested by Mr. Bidwell and Mr. Sutherland for contact inches, is that Dr. Sigard Smith adds the width of the roll bars, to the width of the bed-plate bars, while the width of the roll bars, and the width of the bed-plate bars are multiplied in Mr. Bidwell's and Mr. Sutherland's formula. If Dr. Sigard Smith's formula is used to calculate two beaters, similar in all respects except the width of the roll bars and the width of the bed-plate bars, dimensions of which are given below, it will be seen that they give the same answer. However, it is well known that the rubbing and crushing action of a beater having 3/16 inch wide roll bars, and 1 inch wide bed-plate bars, is entirely different from a beater having 5/8 inch wide roll bars and 9/16 inch wide bed-plate bars.

	Beater No. 1	Beater No. 2
Length bars in roll	= 40 inches	= 40 inches
Number of bars in roll	= 40	= 40
Width of bars in roll	= 3/16 inch	= 5/8 inch
Number of bars in bed-plate	= 10	= 10
Width of bed-plate bars	= 1 inch	= 9/16 inch
Speed	= 400 r.p.m.	= 400 r.p.m.

The beating surface per minute as calculated by Sigard Smith, would be in both beaters, using U. S. standard units, equal to 7,600,000 square inches. The contact inches per minute calculated by the formula suggested by Mr. Bidwell and Mr. Sutherland for:

Beater No. 1 = 1,200,000 square inches.
Beater No. 2 = 2,250,000 square inches.

Mr. N. A. Gray in his (previously mentioned unpublished) article called "Beater Design", refers to the beating surface as being of utmost importance in beater design, and states that it governs the qualitative output. His for-

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mula, however, is the same as Sigard Smith's for "wet beating", except that he employs different symbols.

In the article, "Capacity and Efficiency of Beaters and Refiners", written by J. B. Gough in the June, 1936, issue of the Pulp and Paper Magazine of Canada, Mr. Gough approves of the formula for Contact Inches as suggested by Mr. Bidwell and Mr. Sutherland, but he also prefers a different name. The name Mr. Gough prefers is "rubbing capacity", because he feels that the name should express the action produced. However, as there are other variables that affect the rubbing and crushing capacity of any beater or refiner besides the contact inches, it is better to establish a name that will not be misunderstood in the future.

As the formula and definitions for impact inches and contact inches are only the beginning of the development of definitions and formula for use in the design of beaters and refiners, it is felt that action should be taken to standardize the formula presented by C. Lamont Bidwell, Jr., and D. Manson Sutherland, Jr. This will prevent any further confusion developing in the future, as has developed in the past, not only in the name, but also in the method of calculation.

One Phase of the Effect of Wood Quality On Sulphite Pulp*

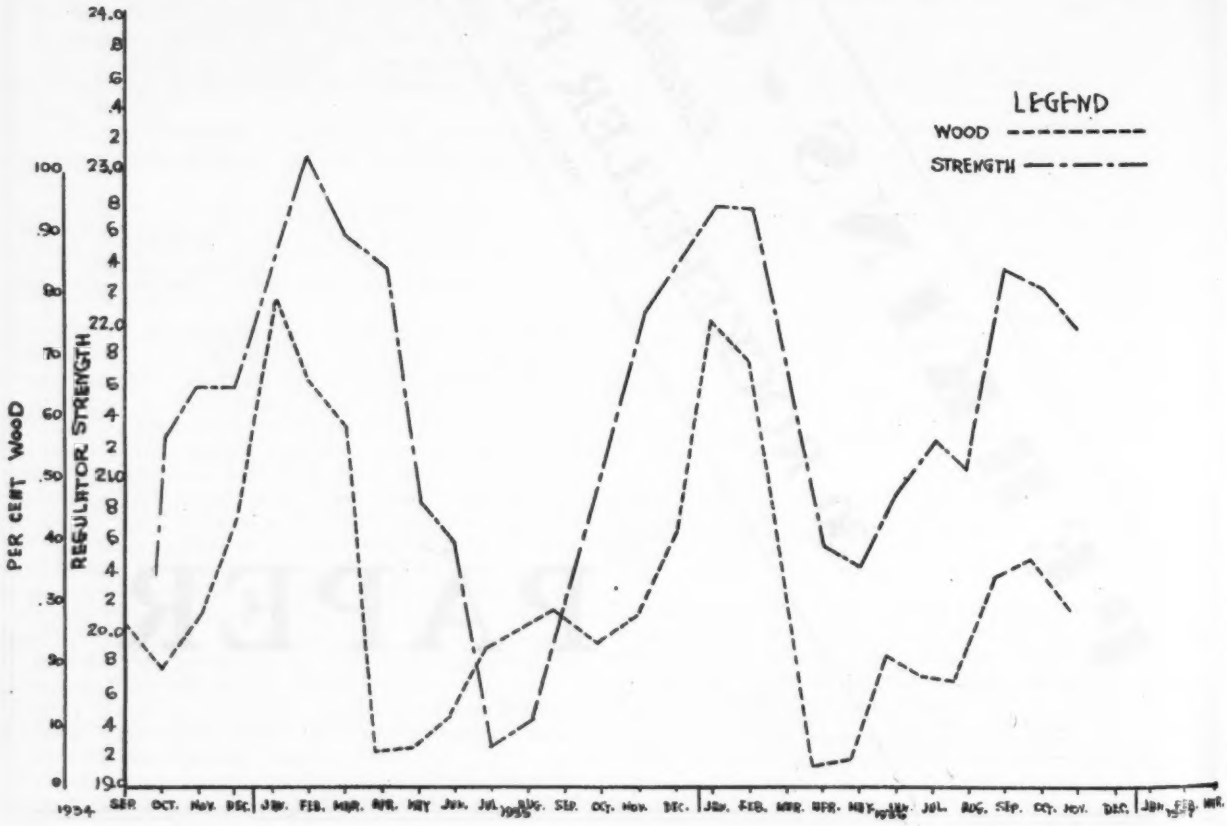
By Vance P. Edwardes[1]

The variations in wood supply encountered in practically all sulphite mills and the effect on pulp quality provide a most fruitful source of argument in which the sulphite man is generally the loser. In only a very few mills is either the wood supply subjected to any chemical tests to determine its fitness or is any accurate measure made of wood used and pulp produced. In other words, no reliable information is made available on which to base the effect of changed operating conditions on either the yield or quality of the resulting pulp. Undoubtedly the pulp industry as a whole is the only chemical industry which knows neither the quality or quantity of its principal raw material or the derived product.

Even though the information available is most sketchy, some very interesting facts can be dug out of wood yard reports and control department routine tests. With this thought in mind, past records in a mill producing the same

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 22-25, 1937.

[1] Member TAPPI, International Paper Company, Palmer, N. Y.



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quality of easy bleaching sulphite from, in general, the same wood sources were studied. Pulp testing, as now established, was first put into operation September 1934. Wood as consumed was arbitrarily divided into three classes: "Canadian"—car or boat wood received from Canada and used at once; "Pile"—wood of Canadian origin but stored in piles for an unknown number of years (1-3); and "Spruce"—truck or rail wood from the Adirondacks or New England, which was used as fast as received. The first two classifications contained not more than 10 per cent balsam, the remainder being principally white spruce, and the last was at least 95 per cent white spruce.

Percentage consumption of the three wood classifications was plotted by months and on the same chart the unbeaten mullen strength of the pulp at the beater room regulator. It was at once noted that the large seasonal swing in pulp strength followed the change in the percentage of "Spruce" used. In order to avoid confusion only one chart is reproduced, that showing "Spruce" percentage and Pulp Strength. During the period shown, from September 1934 to the present, the chlorine number of the pulp has varied within narrow limits (from 1.98 to 2.33) but cooking time decreased from 10.2 hours to 8.0 hours. A study of such other variables as wood gravity, moisture, acid concentration, and maximum temperature failed to show any relationship to unbeaten mullen strength. During the entire period covered, the mill was using chip distribution, forced circulation and indirect heating.

All of which establishes the inescapable fact that wood quality is the most important single variable effecting pulp quality and that of the final product, paper, and it is also the one most frequently overlooked.

A Simplified Method for the Analysis of Bisulphite Cooking Liquor*

By Donald T. Jackson[1] and John L. Parsons[1]

The availability of purified sodium chlorite as a chemical reagent has made possible a simplification of the testing procedure usually employed for the control analysis of bisulphite cooking liquor. The complete analysis, total, free and combined sulphur dioxide, is carried out on a 5-cc. sample without dilution. Satisfactory results, agreeing with the iodate method of Palmrose, are obtained on mill cooking liquors containing lignin residues, etc. The larger sample of liquor used, the fewer pieces of chemical apparatus and solutions required, as well as the rapidity and economy of the procedure, as compared to the official standard TAPPI iodine-iodide method, make this proposed method well suited to the control testing of bisulphite cooking liquor.

The availability of purified sodium chlorite[2] as a chemical reagent, especially as a volumetric oxidizing agent, has made possible a simplification of the analytical procedure usually employed for the volumetric analysis of bisulphite cooking liquor. Less manipulation is required in the proposed procedure because of the complete analysis total, free and combined SO_2, is carried out on one sample of cooking liquor. The amount of sample titrated is considerably larger than is usually employed, which factor contributes towards greater accuracy on the part of the analyst. Furthermore, the procedure gives satisfactory results with the usual mill cooking liquors which often contain varying amounts of lignin derivatives. It also has the advantages of being more rapid and economical than methods heretofore used. A solution of sodium chlorite is easily prepared and standardized. When properly protected from the light it is stable. The chlorite method of analysis seems to be particularly suited to the control testing of bisulphite cooking liquor *(1)*.

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 22-25, 1937.

[1] Member TAPPI, Research Chemist, Hammermill Paper Company, Erie, Pa.

[2] The Mathieson Alkali Works, Incorporated, 60 East 42nd Street, New York City.

Procedure

TOTAL SO_2

Pipette 5-cc. of the bisulphite cooking acid to be tested into a 250-cc. Erlenmeyer flask to which has been added 100-cc. distilled water, 5-cc. of starch-iodide solution and 4 drops of methyl red indicator. Titrate this solution with a 0.3125-N sodium chlorite solution until with constant shaking the blue color persists. Preserve the solution for the determination of free SO_2.

Calculation: Per cent total SO_2 = cc. $NaClO_2$ × 0.2

FREE SO_2

Continuing with the solution from the sodium chlorite titration, discharge the blue color with a drop of 2.5 per cent thiosulphate solution (not necessary if organic substances are present in the sample). Titrate the solution with a 0.3125-N sodium hydroxide solution to the methyl red end point (red to yellow).

Calculation: Per cent free SO_2 = cc. NaOH × 0.2

COMBINED SO_2

Per cent combined SO_2 = per cent total SO_2 minus per cent free SO_2

Note: The above results are expressed in grams of sulphur dioxide per 100 cc. of sample.

Preparation of Reagents

Starch-iodide solution: Prepare a solution containing 1 per cent of starch and 5 per cent of potassium iodide in the usual manner.

Methyl red indicator: Dissolve 0.20 gram methyl red powder in 100-cc. of 95 per cent ethyl alcohol.

2.5 per cent sodium thiosulphate solution: Dissolve 2.5 grams sodium thiosulphate C.P. reagent in 100-cc. distilled water.

Preparation and standardization of sodium chlorite solution. The equivalent weight of sodium chlorite, as an oxidizing agent in an acid solution, is one-fourth of its molecular weight:

$$ClO_2^- + 4H^+ + 4 — \rightarrow Cl^- + 2H_2O.$$

A normal solution of sodium chlorite, therefore, contains 22.61 grams. In order to facilitate the calculations in the analysis of bisulphite cooking liquor, the strength of the sodium chlorite solution should be made exactly 0.3125 normal. This requires about 7.12 grams of pure $NaClO_2$ per liter of solution. Depending upon the purity of the

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salt used this figure should be proportionately increased. Dissolve the required amount of sodium chlorite in freshly boiled distilled water and dilute to the desired volume. Employing the procedure already given, standardize the solution against bisulphite cooking liquor which has been previously standardized against potassium iodate (method of Palmrose) *(2)*. Adjust the sodium chlorite solution until it is exactly 0.3125 normal. The standardized chlorite solution should be kept in a bottle heavily coated on the outside with black paint and wrapped with black paper. This may be lacquered if desired. The solution so protected is entirely stable over a period of several months.

Preparation and standardization of sodium hydroxide solution. Using C.P. sodium hydroxide prepare a 0.3125 normal solution. Standardize against a standard solution of sulphuric or hydrochloric acid, using methyl red as the indicator. Adjust the sodium hydroxide to exactly 0.3125 normal. This concentration facilitates the calculation of the the free SO_2. Assuming a 5-cc. sample of cooking liquor is titrated, by simply multiplying the number of cubic centimeters of standard alkali used by 0.2, the per cent of free SO_2 is obtained.

Results of the Method

The chlorite method of analysis has been compared with the iodate method of Palmrose *(2)* and found to give exact and comparable values. Both methods give slightly higher figures than the official TAPPI standard iodine-iodide procedure *(3)* for the analysis of bisulphite cooking liquor owing to the fact that the iodine oxidation is not quantitative especially in the presence of organic substances in the sample *(2)*. The following comparative results were obtained on samples of bisulphite cooking liquor using the three analytical methods. The quantity of reversible sulphur dioxide *(2)* was found to be so small that it could be neglected.

PER CENT SULPHUR DIOXIDE IN BISULPHITE COOKING LIQUORS

	Iodine Method		Iodate Method		Chlorite Method	
Sample	Total	Free	Total	Free	Total	Free
1	5.09	4.10	5.21	4.19	5.19	4.19
2	5.15	4.26	5.25	4.31	5.27	4.35
3	3.10	1.90	3.14	...	3.14	1.90
4	3.04	1.86	3.07	1.86	3.07	1.84
5	4.99	3.90	5.07	3.93	5.06	3.93
6	5.41	4.42	5.52	4.50	5.51	4.46
7	5.22	4.19	5.32	4.24	5.33	4.26
8	4.80	3.94	4.88	3.94	4.90	3.94
9	5.54	4.64	5.68	4.72	5.68	4.68
10	5.02	4.03	5.17	4.13	5.22	4.11
11	4.77	3.71	5.03	4.00	5.02	3.98
12	5.63	4.54	5.79	4.68	5.74	4.64

Note: All of the above samples contained organic substances (lignin derivatives, etc.) with the exception of numbers 3 and 4.

Comparison of the figures for the iodate and chlorite methods, given in the preceding table, shows satisfactory agreement.

Advantages of the Chlorite Method

The chief advantages of the chlorite method for the analysis of bisulphite cooking liquor are found first, in the use of a larger sample than is usually employed and this is used without dilution for both total and free SO_2; secondly, in fewer manipulations which fact tends towards greater speed and accuracy on the part of the analyst; and thirdly, in greater economy of chemicals and apparatus. Sodium chlorite has four times the oxidizing power of iodine per molecular weight and is considerably less expensive per oxidizing equivalent than either iodine-potassium iodide or potassium iodate. The chlorite solution is easily prepared and standardized. When properly protected from the light the solution is stable. The calculations involved in the analysis have been reduced to the minimum by adjusting the concentrations of the standard solutions to exactly 0.3125 normal. The factor to be used in both titrations is 0.2.

In the presence of a small amount of potassium iodide the reactions involved in the chlorine oxidation probably are as follows:

$$ClO_3^- + 4I^- + 4H^+ \rightarrow Cl^- + 2I_2 + 2H_2O$$
$$2H_2O + 2I_2 + 2SO_3^- \rightarrow 2SO_4^- + 4I^- + 4H^+$$

When all the SO_2 has reacted the free iodine gives the deep blue color to the starch, indicating the end of the reaction.

A new method for the analysis of bisulphite cooking liquor, involving the use of sodium chlorite as the oxidizing agent, has been described.

The methods affords greater speed of operation and accuracy of results by the use of a 5-cc. sample and titrating directly for total and free sulphur dioxide on the same sample. Fewer manipulations and less apparatus are demanded by the chlorite method than with other procedures usually employed.

Sodium chlorite has been found to give an easily prepared and easily standardized volumetric oxidizing solution which is stable when properly protected from the light.

Besides a saving in time the proposed method offers a considerable saving in chemicals.

The chlorite method is especially suited to the control testing of bisulphite cooking liquor.

Comparative tests on bisulphite cooking liquor with the chlorite and iodate methods show satisfactory agreement between the two.

Acknowledgment

Acknowledgment is made of the kindly assistance given by C. H. Steinford in the analytical work and for the valuable help and criticism given by the Mathieson Alkali Works, Inc.

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Non-Fibrous Materials Testing Report

Three authorized committee projects have been set up for the Non-Fibrous Materials Testing Committee. In the original authorizations it was estimated that a final report could be submitted on each of these projects at the February 1937 meeting. However, on account of the complex nature of the materials under consideration, this goal was not realized. Notable progress has been made during the past year, and we are confident that standard methods will be available for testing these materials at an early date. The present status of each of the authorized projects is as follows:

No. 56 STARCH TESTING. This committee has been engaged in studying the fluidity, viscosity and general working properties of various starches. In 1936 the Research Foundation of the Corn Derivatives Institute initiated a similar project, and it was considered advisable for the committee to cooperate with this Institute. At the present time no report is available as to the progress of this work.

No. 57 PIGMENT AND ANILINE DYES. This sub-committee has held one meeting during 1936, at which time a standard method was considered for evaluating the tinctorial strength of dyes used in calender staining and dip dyeing. The original method which had been proposed was revised and is now ready for submission to the committee members. A comprehensive method for testing dyestuffs for beater dyeing has been prepared and is now ready for submission to the committee members. During 1937 we plan to submit samples of dyes to the committee membership and other interested parties for evaluation by the proposed methods.

No. 58 SIZING MATERIALS. This sub-committee has prepared tentative methods for the analysis of rosin size and for wax-rosin sizes. These methods are also ready for the approval of the committee members.—C. E. PETERSON, Chairman Riegel Paper Corporation.

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In the mad rush to fill orders today many mills have discovered that production depends on equipment. That applies particularly to rubber rolls. For, you can't keep up production with a rubber roll that develops faults of any kind.

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T-83

Problem of Paper Mill Modernization*

By Frederic C. Clark[1]

Abstract

Many of the older paper mills have now reached a point in their existence when they are confronted with greatly reduced profits. Some are operating at substantial losses. The past five years has seen some of these mills go out of existence which were formerly highly profitable. Management of these unprofitable mills is confronted with a serious problem both to their stockholders as well as to the communities that depend upon them. Can these unprofitable mills be rehabilitated? That is the question that must be answered.

The answer to this question can only be made as a result of a thorough study of each individual plant, its general layout, equipment, personnel, and sales policy. All of these points must be carefully studied and analyzed in their relationship one to the other. Management is sometimes too close to their own picture to see more than details and fail to see the picture as a whole. Again management may have lost that intimate contact with their business and as a result may not realize how far they are behind their competitors in manufacturing details. All of this makes it difficult for management to prepare a plan because they are unfamiliar with cost estimating for mechanical changes that may be required.

The making of a mill survey for rehabilitation purposes requires a knowledge of plant engineering and engineering cost estimating. It requires a thorough knowledge of operating procedure and ability to determine what each operating unit is capable of producing. It requires a lack of sentiment for those things that grandfather did. It requires an appreciation of the fact that the sole purpose of any manufacturing plant is to produce dollars. Many companies have lived so long with and so close to their picture that they are almost temperamentally unsuited for such a rehabilitation study.

Studies that have been made of a number of these older unprofitable plants have shown that great reductions in costs can be made. In some cases relatively large expenditures if correctly planned can be amortized in one, two, or three years. The first step is to prepare a detailed plan showing what is required and what will be the result on the profit side of the ledger. This article sets forth some of the conditions that make many plants unprofitable, and points out how some of these conditions may be corrected.

Those of us who are old enough to have had an opportunity to view many manufacturing plants, and have seen their ups and downs as measured by returns in plus dollars, may have acquired a viewpoint in perspective that makes it possible to see industry as separate and distinct from a particular plant.

The problems of any individual manufacturing plant are not today found only within its four walls. The real problems, and often those most difficult of solution, are outside the plant. These problems outside the plant involve general economic trends in all industries and specific trends in closely related industries, as well as the trend in the industry of which each particular plant is a part. Management today must keep all of these pictures continuously before it. It must see its own plant in perspective and in relation to its competitors and this perhaps is more important than to see its plant in all its detail.

During the past twenty-five years we have seen the partial or complete eclipse of old, long established paper companies that in the past have been highly profitable. We have observed paper companies that have completely changed their policy and management and as a result have quickly changed from a long record of losses to a highly profitable basis. We have seen paper companies that have earned and paid dividends throughout depressions and have seen paper companies that have been unprofitable even in the boom years 1927 to 1929.

These observations all raise the question—What makes a paper company produce a profit? Is it a great secret of a few managers? Is it geographical location? Is it men, materials, machinery, and markets? Or is it management? There must be a reason. We know there is an "effect" or "result"; therefore, by the most elementary law of logic, there must be a "cause".

The answer to this problem can be very definitely summed up in the one word *management*. Management to be successful in any plant must know and at all times have a clear composite picture of the four M's—Markets, Men, Materials, and Machinery. Management must know and understand and at all times see the relationship of these four M's each to the other. Management must see and at all times recognize the true relationship of its plant and policy to industry in general and its competitors in particular. Lack of this knowledge and these relationships has been the fundamental cause of almost all failures.

Close contact with the paper industry for many years in a wide variety of duties and responsibilities in marketing, manufacturing and management, as an active participant and as a consultant, has made it possible to secure both an intimate picture from the "inside" as well as the very important perspective of the whole. These observations, influenced perhaps by an engineering training and inclination, seem to point out that it is possible to diagnose a plant or a company to determine its ills and then to prescribe for its early recovery, provided of course the patient is willing to recover or is not in its last state of coma at the time a diagnosis is requested.

There is a great similarity between "us humans" and our manufacturing plants and this is not strange because our plants are so much made up of, and dependent upon human beings. Plants think, plants get sick, plants may recover, all depending upon and reflecting the attitude and thought of the particular manager. This attitude and thought of management is consciously or unconsciously reflected throughout the plant. It is therefore little wonder that manufacturing plants and human beings have so many points of similarity. Many plants like human beings require a periodic checking up by someone outside the family who can and will give an unprejudiced opinion and recommend a treatment if that is required.

The depression years have made it possible to study many sick manufacturing plants and from such studies there has been developed a more or less general technique by which such work is carried on. It is hoped that the discussion that follows may be of help to those manufacturing plants that are only a little bit sick and ailing and therefore they may be able to secure some suggestions

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that will enable them to cure themselves. Perhaps it may be possible to bring comfort to some plant in an advanced stage of disease by pointing out that cures have been effected in serious cases of long continued illness. One interesting case can be cited of a plant that was at least ten years behind the times the day it was first started, and for over twelve years it limped along mostly in the red. A survey of this plant, its markets, equipment and personnel presented facts which became the basis for its rehabilitation into profitable operation.

Plants like human beings are similar but not identical, therefore each must be prescribed for as an individual. Their many points of similarity, however, make it possible to set forth some fundamentals having wide application, and it is these fundamentals that will be discussed.

Dollar Consciousness

The most serious criticism today of many manufacturing companies and their management is lack of dollar consciousness. Long dissertations are heard upon the marvelous qualities in their particular product, when you know that their operating costs are above their selling price. You hear much about the high quality and lack of profits of their product, when at the same time you know that there are competitors who are producing a higher quality and at an excellent margin of profit. We hear heads of companies tell of the great profits made twenty, thirty, or forty years ago and bewail their lack of profits now, in much the same tone as the child who had lost its candy because the puppy gobbled it up. Some mills look on profits as God given, for certainly they seem to lack the most elemental knowledge as to how to plan for and make a profit.

Imagine if you can what would happen if you were to pick up a man with no knowledge of seamanship, place him in command of a three or four million dollar ship, give him no instruments for navigation, and start him off from New York City for Europe. Under such conditions a shipwreck is inevitable. Some of our million dollar plants are today being run under much these same conditions.

The first job of the master of a ship is to chart his course from point of departure to destination, and in addition he must be always alert to change his course as occasions require. How many mills chart their courses in advance? Certainly the failures do not, for had they done so there would have been less failures.

The term $ (dollar) consciousness has been used above. By this is meant that plants are built to manufacture $ (dollars). It is immaterial whether the apparent product is news, writing, wrapping, or any of the dozens of other kinds of paper, the real product desired is $ (dollars). Some mills have become so deeply immersed in the glory of making some high grade product that they fail to wake up to the fact that their costs are twenty dollars a ton above the market. The sheriff sometimes wakes them up when it is too late.

All through the mills we hear operators talking and bragging about quality, but no one ever talks about $ (dollars). Some mills even suffer with the disease that $ (dollars) and high quality cannot live together. This is a sad mistake for the successful mills have long ago learned this could be done. We hear many stories about craftsmanship of years gone by and that modern high speed production has greatly reduced quality because of lack of craftsmanship. This is most certainly not true in the paper industry. In early years, a high quality of product was the result of a little skill, no real knowledge, and a lot of luck, and the resultant cost was high and almost any old product sold for a still higher price. Today with much automatic equipment and a real knowledge of materials and processes, we can and do make a higher quality at greatly reduced cost. All kinds and grades of papers of today are vastly superior to those of 100, 50 or 20 years ago.

Large scale production today does not necessarily mean low operating costs and suitable profits. Maximum size plants may not mean the optimum from a profit standpoint. A plant managed with scientific precision will outstrip the one run by rule-of-thumb, but a perfected process or added novelty line may reverse the picture. In other words, the amount of investment no longer stands in a definite relation to the rate of returns.

In by-gone days, the cost of product and the margin left for profit depended on low labor costs. Labor saving devices such as improved machinery, processes and methods have materially changed this picture.

Reorientation Necessary

Modern production or the output per man hour is not alone the result of man's skill and diligence, but is an integration of a large number of variable factors, ranging from the technology of conversion to the automaticity of equipment, methods of planning, scheduling, etc.

While engineering and scientific progress caused all these and many other changes, it fundamentally altered, often beyond recognition, our customary, familiar relations between hours of work and production; wages and output; investment and profits; payroll and overhead; etc.

Thus our traditional mental formulas no longer fit into the new environment; yet, while economic relations have changed, our mental habits remain largely unaltered. It is like going about in the dark in a familiar room in which the furniture has been moved around; we are bound to skin our shins.

A captain of a liner crossing an ocean must have his map or chart and his compass and other navigating instruments. Just merely keeping the bow of his ship in the desired direction will not bring him to his destination. Ocean currents may make it drift; the wind may counteract or increase that drift. He must therefore continually make his observations as to speed, direction, etc., and reorient himself to the chart and continually correct the directions.

Now imagine for a moment that the Gulf Stream has changed its course or its speed, or that some shoals have shifted, or that reefs have appeared, which were not put on the old map. Would the captain be wise to refuse the corrected map on the ground that the old and familiar one had served him well in the past? Or, if the up-to-date map is not yet available, would the captain be guilty of gross negligence if he refused the services of a pilot who had just explored the changes?

The manufacturer of today is likewise confronted with the task of reorienting himself to the changed economic conditions.

The job of reorientation in industry is not a simple procedure because many of the old economic landmarks or guiding points have changed their position or they may have entirely disappeared and new and little known landmarks must now be used. The new economic condition will require that we discard the old notion that all those things that have worked in the past must again work in the future. Many of these old methods or courses will run us onto new economic shoals and therefore new courses must be plotted.

There are many organizations today that seem to be entirely at sea under these new and difficult conditions

that confront them. All of their old trusted formulas now fail them. Many seem to think that if they can hold on long enough things will correct themselves and the long-delayed prosperity of former years will pop out from around some corner. Such organizations may not wake up until aroused by the knock of the sheriff.

The depression of the last five years has resulted in a great reduction in the amount of money spent for repairs, up-keep, and new equipment ordinarily made during years of normal operations. The result of this lack of expenditure is reflected throughout the paper industry and it will require the expenditure of many millions of dollars to bring the industry back to a high state of efficiency. During this depression a few paper companies have been able to keep up their repairs and improvements and they now set the pace for those companies who have not been able to keep their plants in good condition. The next few years will see a vast expenditure of money for improvements in the paper industry. Some of the older and less progressive companies will find themselves so weakened as a result of the depression that they will not be able to meet the new pace and consequently we will see a few more industrial shipwrecks.

The expenditure of the large sums of money which now confronts the paper industry will be wisely or poorly spent depending upon the study and thought that each individual mill gives to its problem. It can make a thoroughly detailed plan of all expenditures required, keeping in mind its market present and future, and determine in advance the benefit in dollars that will result, or it can start out with no plan and little thought and buy, hit or miss, new equipment because their competitor has purchased it. The first method can be made to be successful. The second method can seldom bring success.

The purpose of this discussion is therefore to suggest that each mill, now confronted with large expenditures for repairs and improvements, make its plan after a thorough study of its needs, and to attempt to point out a few of the technical points that should be considered. These suggestions have been grouped under various headings to make for continuity of presentation and discussion. It might be added that every plant regardless of its physical condition or its success as a producer of dollars could advantageously make up its own plan, even though it apparently did not need to spend any money. A plan for improvements might be equally worth while for a mill that has no money to spend. The first thing as well as the most important point is to have a plan.

The Plant Survey

The making of a plant survey has been set forth under the following headings:

1. General statement of problem.
2. Mill layout and buildings.
3. Equipment.
4. Raw materials and supplies.
5. Routing of materials through the process.
6. Products made.
7. Manufacturing operations.
8. Cost control.
9. Proposed improvements and advantages.
10. Personnel.
11. Sales.
12. Conclusions.

1. General Statement of Problem

The problem consists of a study of the present plant facilities, both buildings and equipment; the purchase of raw materials and supplies; the routing of materials through the process; a study of products made; a study of equipment, their capacities and the efficiency of their operations; a study of cost finding methods used or required; a study of improvements to buildings and equipment with cost estimates; a study of advantages gained by these improvements as reflected by a reduction in operating costs; an estimate showing the probable time required to amortize these improvement expenditures; a study of personnel; and a study of sales and sales policy.

The purpose of this study is to present a true and concise picture of present conditions and the necessary steps that must be taken to enable the mill to operate at a profit. Such a study might show that the plant was so obsolete in design and equipment and so far from raw materials and markets that it would be uneconomical to rebuild or attempt any improvements at this location.

Experience in making plant surveys has shown that many expenditures that are required may easily be considered as current repairs, either because they are small or because they may be completely amortized in less than a year. Major repairs and improvements may require larger expenditures which in general are charged to the capital account. In such cases it is generally found that even with relatively large expenditures the resultant economy will enable the amortization of these capital expenditures in less than three or four years; often in much less time.

Each of these proposed improvements should be set up as individual items showing cost, time required to carry out the work and time required to amortize the expenditure. All items should be considered separately and then all items should be considered as a whole. The next step is to consider the order in which each item is to be undertaken. This permits the setting up of a budget to cover the expenditures and the necessary cost controls to insure that estimated returns are secured.

The study of these individual items is most important and management will do well to discuss in detail each item with its engineering and operating staff to insure that all understand exactly what is required to secure the maximum advantage resulting from each expenditure. Management may direct the operation of a mill. It does not operate it. The operation of a mill is carried out by the individual employees all of whom must work together. They must therefore understand just what management requires of them. Too often failure has occurred because of the lack of a plan set up by management and lack of undestanding on the part of employees.

2. Mill Layout and Buildings

In the survey of a mill that has been in existence for a considerable period, it may be found that changes and additions have been made from time to time without any very definite plan for the future trend in the industry. It is frequently found that while buildings are in fairly good condition, the equipment in general requires extensive repairs. Usually the mill has grown by building on various additions, and this generally results in high labor cost. It is often found that raw material is stored in various places throughout the plant requiring excessive handling from receiving platforms into storage and again out of storage to point of consumption. These factors while seemingly small in themselves all result in high operating costs.

Those mills that have grown like Topsy with little consideration for the future and too often little consideration for the immediate present, have generally resulted in the layout of a plant with many areas where congestion occurs. A recent case is cited to illustrate this point.

In this particular mill the growth of buildings has seemed to center around one area containing the main elevator. In tracing the flow of raw materials through the mill and out again as finished products, it was discov-

ered that every pound of finished product had passed eight times through this small elevator area. Congestion at this point was almost unbelievable and practically all of it could have been corrected years ago if there had been a carefully thought-out plan.

Competition today demands that every possible economy be secured in the operation of an industrial plant. This competition has been so keen during the past few years as to put a serious burden on mills having inefficient layouts, and operating at production rates appreciably below those of their competitors. Present day competitive conditions are such as to warrant the statement that these older mills can never be successful until their operating conditions are very definitely improved. Many of the older plants could make savings from $1.00 to $3.00 per ton of finished product by a careful study of their mill layout and buildings and the installation of all possible labor saving equipment.

An adequate storage space, suitably protected from the weather is a real economy, particularly so in the Northern mills which are subjected to severe winter conditions. Storage spaces of this kind must always consider the possibility of future expansion as many of these older mills may not be able to compete unless they find some means of increasing their output.

It is again emphasized that any improvement in a paper mill should be made only after determining every possible requirement for ten years or longer in advance. Many mills too often consider only the immediate future and then find too late that a broader study of the immediate problem would have enabled them to have secured greater advantages, both immediately and in the future. It is because of this fact that it is continually emphasized that a mill should at all times have a plan for expansion laid out a long time in advance of their requirements. It costs little to have such a plan while the lack of such a plan is invariably found to be expensive.

3. Equipment

Under the heading of equipment should be included a study and report on power plant, both steam and water, stock preparation equipment, paper machines, chests, pumps, stock lines, finishing room equipment, receiving and shipping facilities, water filters, and a general survey of plant maintenance.

Steam power plants of the old horizontal return tubular type are highly inefficient and it may be advisable to calculate the possible savings that would result by the installation of a modern boiler plant. Frequently the savings secured by such modernization is sufficient to amortize the capital expenditure in less than four or five years' time.

Water wheels, if old, will in general be found to be very inefficient. In such cases the forebay and intake gates, as well as tailrace should be examined to see whether there are any restrictions that could be removed and increased power secured as a result.

The matter of stock preparation equipment is generally found to be inadequate. Paper machines are generally in fair condition. Chests, pumps, and stock lines in general are in fair to poor condition. Filter plants, particularly if of the pressure type are generally in poor condition.

It is frequently found that maintenance and repairs have been held to a minimum on the theory that this is a saving. Generally quite the reverse is true. We frequently hear the statement made that the amount of dividends or earnings of any company may best be determined by the cleanliness of its basement, and it seems almost invariably true that poor housekeeping and low or no profits go hand in hand. An observation of many cases leads one to believe that poor housekeeping preceded lack of profits, and that poor housekeeping is not the result of lack of profits.

The study of equipment is extremely vital to any plant and a survey must consider each piece of equipment, its capacity, and whether it is capable of doing the work required.

Poor equipment in a badly laid out mill in which there is a great deal of physical congestion produces a very serious handicap to any superintendent and operating organization. More than one case has been observed where these handicaps were so serious as to make it impossible for any superintendent to operate the mill at a profit.

4. Raw Materials and Supplies

A careful study should be made of raw materials and supplies now in use to determine whether they are best adapted for the purposes intended. It is frequently found that hard pulps are used where soft, easy beating pulps would be much more satisfactory; and soft pulps being used where hard pulps are more advantageous. All of these points must be considered if a mill is to meet the competition of the mill that takes all of these possible savings into account.

In some mills it is possible to use truck shipments in place of rail deliveries. In several mills where incoming shipments of raw materials have been changed from rail to truck, there has resulted a saving from $1.00 to $2.50 per ton.

5. Routing of Materials Through the Process

It is important to prepare at least a simple line sketch showing the general layout of the plant and the routing of materials throughout the process. In most cases the mill fire insurance map is ample for this use. For larger and more complicated mill layouts, it will be necessary to make up a sketch showing the relationship of buildings to each other and the paths through which raw materials progress to the finishing room or shipping room platform.

6. Products Made

A study should be made of the general quality of products made by a particular mill as compared with similar products made by competitors. Such a study should be made continuously if a mill is to keep abreast of the times. This study, together with the work of testing the materials purchased, is of sufficient importance in most mills to warrant the installation of a suitable laboratory. It then becomes the duty of management to see that the laboratory is properly and continuously used.

In the past a laboratory has too often been considered necessary scenery, and both management and the operating department have made little or no use of the laboratory facilities, largely because they have not understood what the laboratory could do for them.

7. Manufacturing Operations

Serious criticism can be made of many older mills. The degree of criticism is frequently in direct proportion to the age of the mill. This criticism is based on the fact that the older mills have not kept up to date. They usually have very little knowledge or appreciation of what their competitors are doing, particularly the more progressive ones. Especially is this true where, during the early period of its existence, it has been highly profitable. Profits in those days, however, were the result of a wide spread between operating costs and selling price. Today this spread is very small and has been set by the more efficient mills.

We have been preaching these facts to many mills for several years past. Some of these mills seem to believe that a miracle would happen and profits would go up to those of twenty or more years ago. Some of these mills have now ceased to exist and there are others on the verge of elimination.

Management in many mills does not know the true capacity of its equipment. No mill can today operate at maximum efficiency, which means minimum cost at maximum production, without complete operating records from which the actual costs by grades may be determined. The management of any mill is seriously handicapped without these detailed mill records, such as speed, trim, basis weight, both actual and nominal, detailed cause of lost time, and other operating data. Such data when properly presented to management will at once show what changes must be made to overcome the factors that result in high costs and low production. No mill can today run without this information as competition is so keen that advantage must be taken of every possible economy. Obsolete equipment or inefficient personnel must be recognized at once, and then a decision made whether to apply the necessary remedy or to continue with ultimate disaster to all concerned. Unfortunately the management of many mills believe that they have sufficient information to permit them to make important decisions of policy, but too often this is not true.

In some lines of equipment it is possible to ask the builder for technical data in regard to capacities, efficiencies, power consumption, etc. For example, builders of boilers, steam engines, motors, and many other types of equipment have developed such information and can tell the buyer exactly what can be produced under any of the varying conditions met with in practice.

The builders of paper machines, beaters, jordans, and other pieces of paper mill equipment cannot give this same information to the purchaser. As a result, there is little basic information in the industry as to just what each piece of equipment will do under certain definite mill conditions. This too frequently results in equipment being operated at rates appreciably below its real capacity. We often find that a paper machine on exactly the same weight for the same finished product will be operated from day to day at appreciably different production rates. Such a condition exists in almost every paper mill. It should again be emphasized that management should determine what each machine is capable of doing and not accept somebody's guess. Having set up a production rate, management must see that this rate is met at all times. Breakdowns will of course interfere with this schedule, and a certain amount of lost time is warranted, but the amount that is permissible in most mills is appreciably less than the actual lost time that is encountered.

In presenting any statements in a report of this kind, they should be backed up with specific instances.

Table I presented here is taken from the records of a paper mill and illustrates what is invariably found where the necessary detailed records are not kept. This tabulation shows the operating conditions on a particular paper machine for a period of eight days, this part of the record being chosen as illustrating what is generally found.

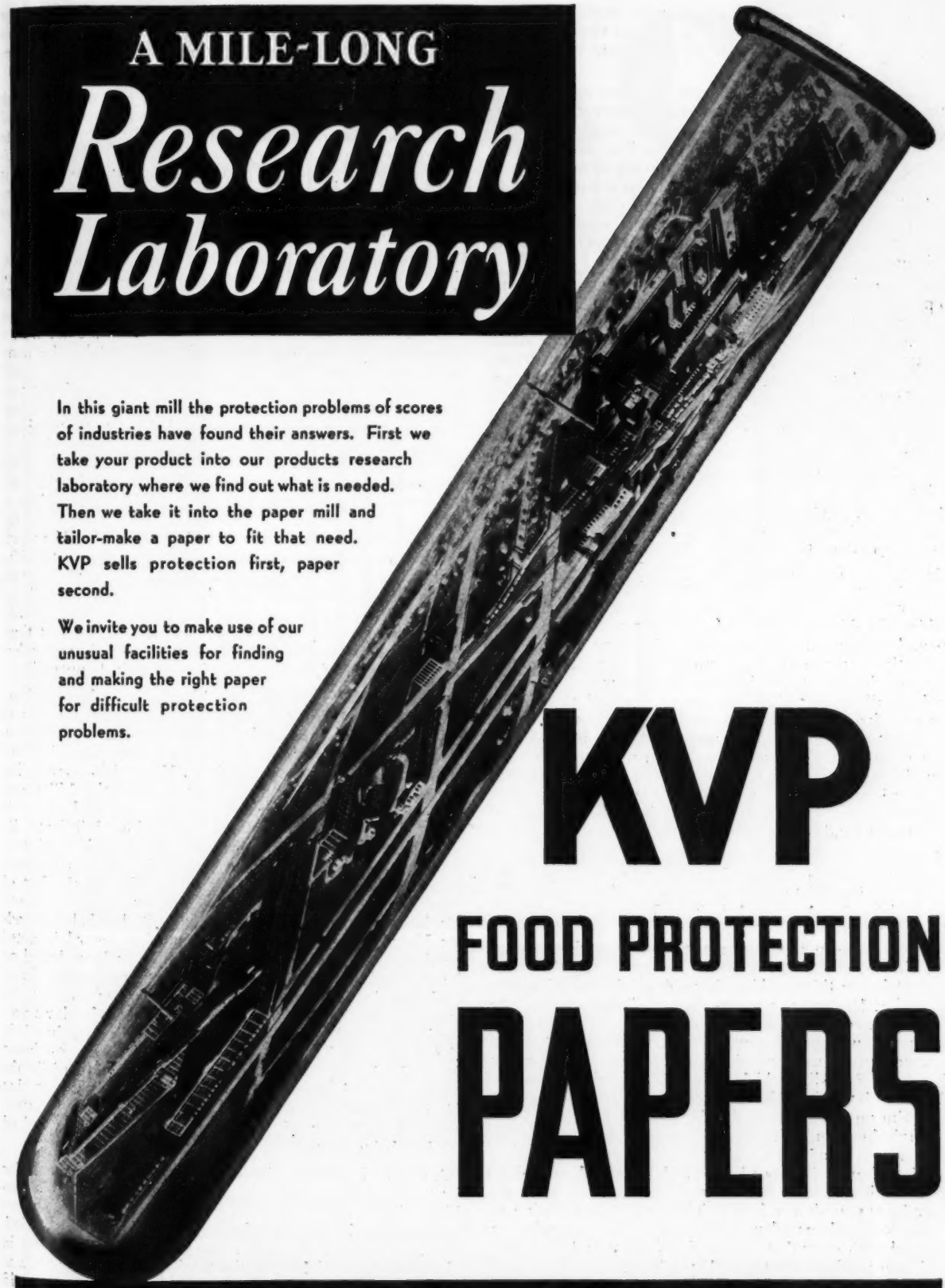
So much of the operating time of a paper machine is required to cover costs of raw materials and supplies, light, heat and power and fixed charges that very little time is left for profits. Therefore management must have an accurate record of lost time in order that the necessary steps may be taken to reduce unprofitable operating periods. By referring to this tabulation it will be possible to follow

TABLE I

Production—Machine Record								Production—Actual Rate						
Date	Lot No.	Hrs. Run	Lbs. Made	Hrs. Lost	Cause of Lost Time	Pdih	Lbs. per Hr.	Wt of Sheet	Trim	Speed	Lbs. per hr. based on W. T. & S.	Equi. Pdih	Actual Lost Time	Unrecorded Lost Time
Col. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
14	1	5¾	7,558	2¼	1½—stock ¾—clean wire	16.5	1315	157	80	110	1990	24.9	...	...
14	1	8	14,166	...	.....	22.1	1771	157	80	110	1990	24.9	...	...
14	1	3¼	7,496	1¼	¾—washup 1 —chaser	28.8	2305	157	80	110	1990	24.9	...	...
14	2	3	1,583	....	.....	6.6	528	146	80	110	1850	23.1	...	...
..	..	20	30,803	4	.....	19.2	1540	...	....	...	....	...	7.80	3.80
15	2	3¼	6,488	1¼	¾—washup 1 —chaser	24.9	1995	146	80	110	1850	23.1	...	...
15	3	..	.....	3	Stock	...	....	203	75	72	1580	21.1	...	...
15	3	7	9,176	1	Washup	17.5	1311	203	75	72	1580	21.1	...	...
15	3	8	13,814	...	.....	23.1	1730	203	75	72	1580	21.1	...	...
..	..	18¼	29,478	5¼	.....	21.1	1615	...	....	...	....	...	6.00	0.25
16	3	8	9,960	...	.....	16.6	1245	203	75	72	1580	21.0	...	...
16	3	4¼	7,972	½	Washup	25.0	1875	203	75	72	1580	21.0	...	...
16	4	2½	3,320	¾	Stock	17.3	1327	170	76¾	110	2060	27.0	...	...
16	4	8	12.930	...	.....	21.5	1616	170	76¾	110	2060	27.0	...	...
..	..	22¾	34,182	1¼	.....	19.8	1500	...	....	...	....	...	5.00	3.75
17	5	8	15,734	...	.....	25.7	1967	170	76¾	110	2060	27.0	...	...
17	6	8	15,892	...	.....	25.7	1974	170	76¾	110	2060	27.0	...	...
17	7	8	15,964	...	.....	26.0	1995	170	76¾	110	2060	27.0	...	...
..	..	24	47,590	...	.....	25.9	1985	...	....	...	....	...	1.00	1.00
18	7	24	46,012	...	.....	25.0	1930	170	76¾	110	2060	27.0	1.75	1.75
19	7	16	31,182	...	.....	24.7	1945	170	79	110	2135	27.0	...	...
19	7	7	12,460	1	Washup	22.5	1780	170	79	110	2135	27.0	...	...
..	..	23	43,642	1	.....	24.0	1895	...	....	...	....	...	3.50	2.50
21	8	8	8,692	...	.....	13.9	1086	178	78¼	86	1730	22.1	...	...
21	8	8	14,464	...	.....	23.1	1808	178	78¼	86	1730	22.1	...	...
21	8	8	14,340	...	.....	22.9	1793	178	78¼	86	1730	22.1	...	...
..	..	24	37,496	...	.....	20.0	1565	...	....	...	....	...	2.25	2.25
88	9	8	12,279	...	.....	19.6	1536	178	78¼	86	1730	22.1	...	...
22	9	6	8,904	2	Washup—stock	19.0	1483	109	78¼	86	1490	19.0	...	...
22	10	7	8,912	1	Washup	16.3	1272	109	78¼	86	1490	19.0	...	...
..	..	21	30,095	3	.....	18.3	1432	...	....	...	....	...	5.00	2.00
	Total	....	.....	15.0	.....	...	....	...	....	...	....	...	32.3	17.3
	Average	....	.....	1.9	.....	...	....	...	....	...	....	...	4.0	2.1

A MILE-LONG

Research Laboratory



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FOOD PROTECTION PAPERS

KALAMAZOO VEGETABLE PARCHMENT COMPANY
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more clearly this decision which may seem somewhat technical, but it is so important, in fact, so vital to a company, that we believe it should be given here in considerable detail.

The production rate on a paper machine may best be determined by figuring the pounds of paper that can be dried per inch of (trim) width. The principal factor in determining the capacity of a paper machine is its drying surface. We have studied close to a hundred machines on all grades from tissue to board, and from ground wood to the highest grade new cotton and linen rags. From the data secured we have determined that a square foot of drying surface should dry at least one pound of paper per hour.

Some machines have been found in operation drying 0.6 pound and other machines have been found running on the heaviest weight index bristols, made of 100 per cent new rags beaten 18 hours, in other words, very slow stock, drying at a rate of 1.5 pounds of paper per foot of drying surface per hour. Many mills where these figures are recognized and studied are producing from 1 to 1.25 pounds of paper per square foot of drying surface per hour. Therefore, using 1 pound as a base figure, the capacity of any machine can be determined, and this shows what actually is being produced on definite weights and grades.

In a recent study made of a company having a number of paper machines making a very wide variety of papers, it was found that the average production rate was 1 pound of paper per square foot of drying surface per hour, with variations from 0.5 pound per square foot of drying surface per hour to a maximum of 1.5. Almost half of the machines in this company were producing at a rate below 1 pound of paper per square foot of drying surface. It frequently occurred that two machines of approximately the same size on almost identical papers were producing at widely different production rates. Part of this difference was due to mechanical conditions that could be corrected, but a large part of it was due to the lack of adequate records, and to the fact that management did not know the capacity of the paper machine. In this particular case a relatively small expenditure per machine for repairs would have made a tremendous difference in production capacity, and more important still, a very large reduction in operating costs.

Referring now to Table I, which applies to a paper machine having thirty 42-inch driers. (This is exclusive of felt driers.) A strip 1 inch wide around a 42-inch drier has an area of 0.92 square feet, and 30 driers give an area of between 27 and 28 square feet of drying surface per inch of width of machine. This means that for each inch of trim on this machine there is an area of 27 square feet, and at 1 pound per square foot of drying surface per hour, this is equivalent to 27 pounds of paper per inch of width per hour. In other words, this machine at 1 pound of paper per square foot of drying surface per hour has a factor of 27 Pdih, which means 27 pounds per deckle inch hour. Therefore the production rate on this machine is the trim on any order multiplied by this factor 27. An 80-inch deckle should dry at not less than 2160 pounds per hour. If the production rate of 1.2 pounds per square foot of drying surface per hour can be attained equivalent to 32.4 Pdih (1.2 x 27)—the production rate is approximately 2600 pounds per hour. Therefore this machine at 80-inch deckle should dry not less than 2160 pounds per hour, and with everything in good condition and kept that way, it can produce 2600 pounds per hour.

These rates are being exceeded in many mills where constant daily attention is given to these matters, and they can be attained on the machine shown in Table I if the necessary data covering each day's run are available. It is recognized, however, that to secure these rates some mechanical changes will be required.

It is of interest to note that at times this machine with its present mechanical handicaps has very nearly equaled these production rates, so that it is entirely within reason to secure these rates on continuous runs if the necessary effort is put forth on the part of the management. It is believed that when these rates are secured and recommended changes made, there will be a very material change in the profit item.

Referring again to Table I, it will be noted, for example, that on the 14th, two lots were made. The first item listed shows that this machine ran 5¾ hours, produced 7558 pounds, and had 2¼ hours of lost time (1½ hours lost time waiting for stock and ¾ hour lost time for cleaning a cylinder). By dividing the pounds reported by the number of hours run (7558/5¾) a figure of 1315 pounds will be obtained, which is the reported pounds per hour produced by the first tour. According to these figures, therefore, the machine was operated at 1315 pounds per hour, and as the trim was 80 inches, this is equivalent (1315 ÷ 80) to 16.5 Pdih. However, the machine records show that the basis weight on this grade was 157 pounds, with 80-inch trim and the speed 110 feet. This is equivalent to 1990 pounds per hour, or 24.9 Pdih. Obviously these figures do not agree as there is a difference of 675 pounds between the 1315 and the 1990 pounds per hour rate. The probability is that the weight, trim, and speed are correct, which means therefore that the first tour operated for just two thirds of the reported 5¾ hours. In other words, the machine tender did not put down his actual lost time. Experience in many mills with many machine tenders leads to the belief that this is what actually happened.

The total day's run on the 14th shows 20 hours of operation, producing 30,803 pounds. This is equivalent to 1540 pounds per hour, and at 80-inch trim, is equivalent to 19.2 Pdih. You will note that at the last part of the third tour the weight was changed from 157 to 146 pounds, but the speed was not changed. Obviously if the 157 pound basis weight could be run at 110 feet, it should be possible to run 146 pound basis weight faster than 110 feet. By referring to column 12, you will note that the real production rate per hour based upon weight, trim, and speed, varied from 1990 pounds to 1850 pounds for the last of the third tour, or an approximate average of 1900 pounds per hour. By referring to column 8, headed "Pounds per Hour", calculated from the machine record is noted the figure 1540 pounds as the amount per hour based on the reported running time. If the 30,803 pounds produced is divided by the 1900 pounds per hour (which was the average operating rate) it will be found that the day's production (30,803 pounds) could have been produced in 16.2 hours; and this figure subtracted from 24 hours shows 7.8 hours of lost time on that machine while the machine records show only four hours. This means that this paper machine lost 3.8 hours of production (approximately 16 per cent of 24 hours) without any record of this loss being brought to the attention of management.

A study of Table I will show corresponding records for seven succeeding additional days' operation of this machine. These eight days are representative of conditions under which this machine has operated for a long period. In this connection it is of interest to note the figures in columns 5, 14, and 15, and the total and average figures at the foot of these columns. The reported lost time was 15 hours and the actual was 32.3 hours, or the unreported lost

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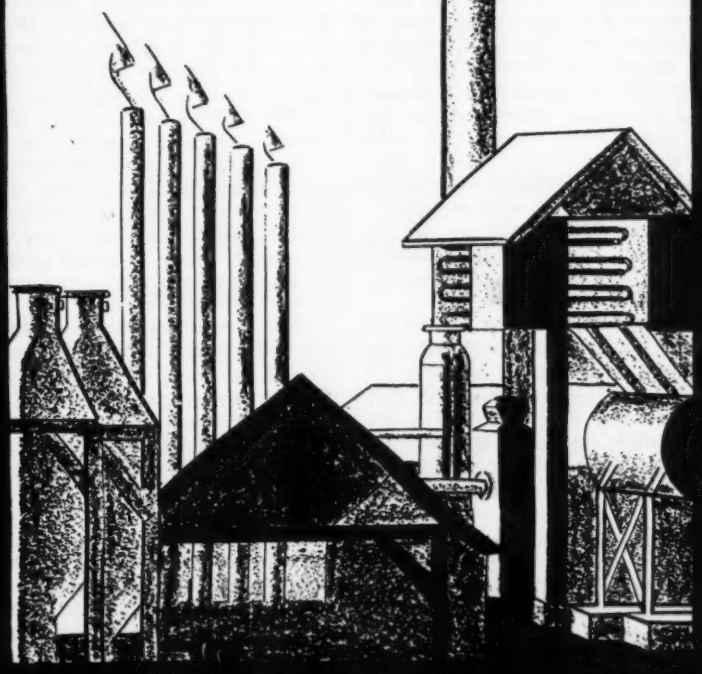
JACKSONVILLE FLORIDA



PAPER SIZE

MANUFACTURED IN THE HEART OF THE NAVAL STORES BELT FROM GUM ROSIN, AT OUR PLANT, JACKSONVILLE, FLORIDA.

GUM ROSIN

DEALER AND DISTRIBUTOR TO THOSE MILLS NOT BUYING PREPARED SIZE.

A DEPENDABLE SOURCE OF SUPPLIES, CONFORMING TO THE MOST EXACTING REQUIREMENTS OF THE PAPER MAKING INDUSTRY. OUR PRODUCTS HAVE BEEN FOUND TO BE CONSISTENT AND OF THE HIGHEST QUALITY, BY THE LARGER PAPER MILLS. PRICES AND SAMPLES SUBMITTED UPON REQUEST.

time was 17.3 hours. Expressing as an average for the eight days, we have the following figures: Reported lost time per day 1.9 hours; actual 4.0 hours; and unreported 2.1 hours. These conditions noted above are similar to those found in many mills where a machine tender keeps records without recording instruments to give correct figures.

This condition may best be summed up by saying that management sustained a loss on this machine of over $75.00 per day, without having any knowledge that this condition existed. Losses cannot be corrected and changed into a profit if we do not know where or when they occur. It is essential to secure a maximum production rate, but it is also important to have actual figures of lost time with definite information as to the causes. Then the management can decide what changes should be made in equipment or personnel in order that the paper machine may be operated at maximum profit.

The detailed information in Table I is presented to show one of the fundamental reasons why many mills fail to make a profit. The facts shown here must be corrected before any other steps are taken. The responsibility for these conditions rests entirely with management who should know the possibilities of the equipment and should set up standards to be met. The management should then hold the operating personnel to these standards. This is possible if there is the proper kind of training and cooperation between them. It is again emphasized that these conditions are found in many mills and there is no question but that a proper study of the facts and the taking of the necessary correction measures will prove highly profitable.

In this particular case the lost time for the month reported by this machine was 48 hours, while the actual non-productive time was 110.5 hours, or the actual loss was 2.3 times the reported lost time. This particular month had 26 days, therefore its reported lost time was 1.85 hours per working day per month, while its actual non-productive time was 4.25 hours per working day per month. It is obvious that no mill can long survive under such poor operating conditions.

In discussing the reason why certain weights are run at certain speeds, the statement is usually made by the operating department that the same speeds are always run on the same weights and grades. Experience, however, shows that this is not the case. The same basis weight and grade may show speed variations of over 50 per cent between the high and the low records. This large variation in production rate is the result of the fact that definite speeds are not set for each weight and grade. It is essential that this be done, and if difficulty is encountered, the cause of this difficulty should be determined and eliminated; otherwise, one may expect to encounter these large variations in production rate even on the same weights and grades.

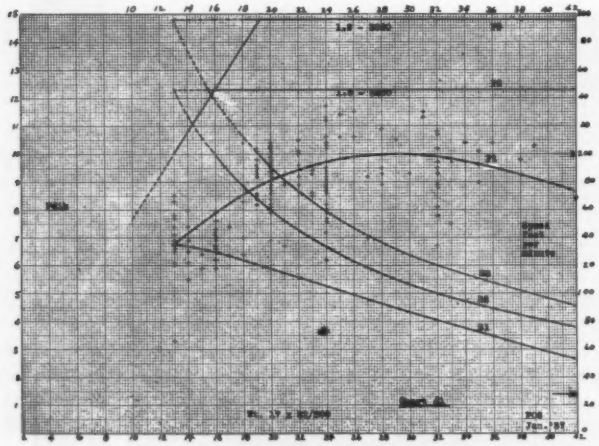


Fig. 1

It is also true that the various weights of a grade should and can be run at speeds that are inversely proportionate to the change in weights. For example, a 50-pound paper can be run at twice the speed of a 100-pound paper. This of course assumes that mechanical conditions are correct, and if they are not correct, they should first be corrected.

It is recognized that paper machines generally do not vary their speeds in an inverse proportion to the change in basis weights. For example in a recent case, 106-pound paper was being run at 160 feet per minute, yet a study of the records shows that 130-pound paper was generally run at 162 feet per minute. Further study of the records shows that the machine gave excellent results while running the 130-pound paper at 162 feet. Therefore with the same furnish, beaten in the same way, there could be no excuse for running 106-pound paper at 160 feet, when its correct speed is 198 feet. In other words, it was running 38 feet (24 per cent) slower than it should to maintain a constant production rate on the machine.

This matter of speeds at various weights of paper is the cause of one of the greatest losses in the operation of a paper machine. In many mills it is possible to materially increase the production of the paper machine as a result of a proper study of actual operating conditions, and then the setting of the production rates at which each machine is capable of operating.

Mills frequently encounter difficulties in forming, pressing and drying paper. These difficulties are generally blamed on stock, its freeness, slowness, or other characteristic. From long experience covering the entire paper industry it seems obvious that the real cause of these difficulties is very largely mechanical, and is a result of original improper design of equipment or lack of repairs. If the mechanical errors are corrected, then the difficulties due to slow and free stock practically disappear. Correct those things which are mechanically wrong in a paper mill and you will have corrected about 90 per cent of those things now blamed on weather, personnel, or raw materials.

The best way to illustrate the tremendous losses that may occur on a paper machine as a result of not setting the correct speeds for each basis weight may best be illustrated by the following graphical charts. These graphical charts have all been drawn from actual machine production data covering periods from one to two years. In some cases the machines have produced a variety of grades of paper. In other cases, however, there has been very little variation in grade. Consequently it is not possible to explain these variations in production rates, at various basis weights, except as a criticism of management.

Explanation of Production Charts

Explanation of Fig. 1

Fig. 1 is a fairly typical production chart for many paper machines. It will be noted that at the bottom of the chart there is a range of basis weights on a folio basis (17 x 22/500) ranging from 8 to 42 pounds. On the left hand side of the chart the vertical scale is pounds per deckle inch hour (Pdih) and applies to curves P1, P2, and P3. The vertical scale on the right hand side of the chart is speed of the machine in feet per minute and applies to curves S1, S2, and S3. This machine trims approximately 80 inches and produces high grade rag book and medium grade, hard sized rag papers.

The series of dots along any of the vertical lines of the

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WE THINK WE HAVE ADVANCED ONE STEP FURTHER!—
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WE CHOSE THE NAME S.P.S. BECAUSE IT STANDS FOR SELECTED PARTICLE SIZE AND CONVENIENTLY REPRESENTS THE THREE MAXIMS OF OUR BUSINESS.—THE FACILITIES OF OUR ORGANIZATION ARE AT YOUR SERVICE; WE ARE STRIVING TO PRODUCE SOMETHING TO PERFECTION; WE CONSIDER YOUR SATISFACTION OF THE UTMOST IMPORTANCE.
WE ASK YOU THEREFORE TO MAKE A TRIAL OF THIS CLAY.
THE MATTER RESTS WITH YOU-WE ARE CONFIDENT OF THE RESULTS.

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NEW YORK

chart represents individual runs and the production rate at each of these individual runs. For example, at 24-pound folio, the lowest dot is 6.2 Pdih, the highest is 11.7 Pdih, or a difference of almost two to one. This means that during one run of 24 pound paper the machine was producing 6.2 pounds of paper per inch of width per hour; while at another time it was producing 11.7 pounds of paper per inch of width per hour. The difference in the character of papers run on this machine cannot explain this difference in production rate.

The curve marked P1 has been drawn representing the average production rate at each basis weight. From the curve it is noted that this machine shows the highest production rate at approximately 30-pound basis weight. At this point the average is 10 pounds per deckle inch hour. It must be obvious to anyone that if a 30-pound paper can be produced at a rate of 10 Pdih, it should be possible to produce almost the entire range of weights at a point much nearer this 10 Pdih rate, than is shown by the curve. In other words, this curve should be more nearly a straight line. In fact it should be a straight line above a certain basis weight.

Curves P1, P2 and P3 are production rate curves. Curves S1, S2 and S3 are Speed curves.

Curve P1 is the average production rate as formerly run.

Curve P2 is the production rate at 1 pound of paper per square foot of drying surface per hour.

Curve P3 is the production rate at 1.2 pounds of paper per square foot of drying surface per hour.

Curve S1 shows the average speeds of the paper machine in feet per minute corresponding to the average production rate Curve P1.

Curve S2 shows what speeds this machine must run at each basis weight to produce at the P2 production rate.

Curve S3 shows the machine speeds required to produce at the P3 production rate.

The area between curves P1 and P2 shows the relative loss in production as a result of operating at below capacity. The curve P2 is at 12.3 Pdih, while the average value for curve P1 is about 9.3 Pdih or less. The present production of this machine therefore could be increased (12.3 — 9.3) ÷ 9.3 or 32.2 per cent with probably no expenditure except a little will power on the part of the management. Moreover if the machine is put into good mechanical condition and there is sufficient effort made, it is possible to increase the production rate to 14.8 Pdih. The difference between 14.8 and 9.3 = 5.5 Pdih. An increase in production rate of 5.5 Pdih is 5.5/9.3 equal to 59.1 per cent.

To express this picture more concretely, this paper machine formerly produced 14,300 pounds per day average. The average now is 18,900 pounds (an increase of 32.2 per cent) and improvements have been made so that this machine will produce at least 23,800 pounds per 22 hour day.

Every mill should make up a graphical chart of each paper machine. Management must know what its equipment can do; then proceed to train its operatives to secure the results set up as standard. Many paper machine operators do not know how to figure the speeds at which a given basis weight should be run on any particular machine. Every paper machine has a definite production capacity dependent on its wet end, driers and mechanical conditions and may best be expressed in pounds per deckle inch hour (Pdih). This Pdih factor is a constant at all basis weights above a definite minimum. This minimum basis weight above which the production rate is constant and below which the production rate decreases, is dependent upon mechanical conditions.

By referring to curve P1 (at 1.0-pound of paper per square foot of drier surface per hour) it is noted that production rate (Pdih) is at a maximum at about 17 x 22-30/500 and it decreases at weights above or below this point. Curve P2 shows a constant production rate at all weights from 17 x 22-16/500 and a decrease below this weight, because this is the speed limit of the machine. Curve P3 (at 1.2 pounds per square foot per hour) shows a constant rate of 14.8 Pdih for all weights above 17 x 22-19/500 and a decrease in Pdih below 17 x 22-19/500 because of speed limitations.

The number 3200 on curve P2 and 3850 on P3 are the speed-weight (17 x 22/500) factors at those two Pdih rates. The speed of a paper machine varies inversely as basis weight (above a minimum as noted above).

For example the machine represented in Fig. 1 has 12.3 square feet of drier surface per inch of width, multiplying 12.3 x 260 = 3198 or 3200 for a rounded figure. The constant 260 is a value that is dependent upon ream area and applies to the size 17 x 22/500. If the ream size was 25 x 38/500 the constant 260 would be 660, so that if this machine made book paper the speed-weight factor would be 12.3 x 660 = 8118.

As speed and basis weight vary inversely, then the product of speed (in feet per minute) multiplied by basis weight in pounds per ream is a constant and is the speed-weight factor referred to above. Let us assume therefore that 3200 is the speed-weight factor as noted above, then the correct speed for any weight (up to the speed limit of the machine) is the basis weight (17 x 22/500) divided into 3200. For example as follows:

16 pounds (17 x 22/500) = 200 feet
20 pounds (17 x 22/500) = 160 feet
32 pounds (17 x 22/500) = 100 feet, etc.

To many people, much if not all of this explanation is I am sure very elementary, while most elementary to many, there are a few mill managers who do not appreciate its importance, and most machine tenders do not understand it at all. Mysteries are those things not understood. The paper industry is full of "old granny" mysteries. Clear up these mysteries and then we can expect to attain the goal we have set.

Explanation of Fig. 2

Fig. 2 is a somewhat wider machine in the same mill producing approximately the same grades throughout its range of basis weights. Here again it will be noted that there is a wide variation in production rate at each basis

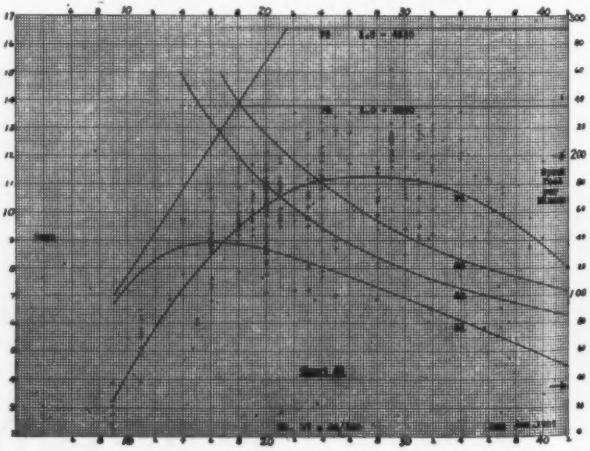

FIG. 2

weight shown. Also it will be noted that there is a much larger variation in the curve showing the average production rate than was shown in Fig. 1. A study of the dots at about the same basis weights will show even more variation in production rate than was noted in Fig. 1, especially at the 24-pound basis weight.

The explanation of Fig. 1 applies also to Fig. 2 except of course for the change in figures. Fig. 2 shows at a glance the wide change in Pdih over the basis weights made. The curve P1 (average Pdih) rises from 3 at 9 pounds to 11.3 at 27 pounds then decreases to 8 at 42 pounds. This machine is interesting because of the "hump" in the curve P1. The area between P1 and P2 is lost production because the machine was not run at its proper speed. Note the Pdih values at 24 pounds basis weight (17 x 22/500). The lowest is 7.7; the highest is 14.1; and the machine if put into condition and the operators suitably trained can increase to 16.6 Pdih. Briefly the production capacity of this machine is 60 per cent greater than its average capacity. Is this worth working for?

Explanation of Fig. 3

Presenting Figs. 1 and 2 as rather typical charts of what is frequently found, may leave the impression that it is impossible to secure production at the light weight end of the scale and at the heavy weight end of the scale at rates more nearly equal to the production rate secured at or near the middle of the scale. Fig. 3 will illustrate that it is possible to produce a wide range of weights and maintain a relatively constant production rate per inch of width.

Fig. 3 is the record of a small machine trimming about 75 inches producing high grade writings, ledgers, and index bristol. The entire production of this machine is on high grade papers ranging from 65 to 100 per cent rag content. The bulk of the production is on 100 per cent new rag stock beaten from 16 to 18 hours. The production, therefore, of this machine represents what is being regularly secured on a machine producing a wide range of weights of papers made from extremely slow stock. In fact, the production rate on this machine, with very slow stock is one of the highest of any records that I have obtained to date. The maximum drying rate per square foot of drying surface per hour on this machine is 1.65 pounds of paper per square foot of drying surface per hour. This high drying rate, particularly on papers weighing 109 pounds folio, made of 100 per cent rag stock beaten 18 hours, is at least a very strong indication that very slow

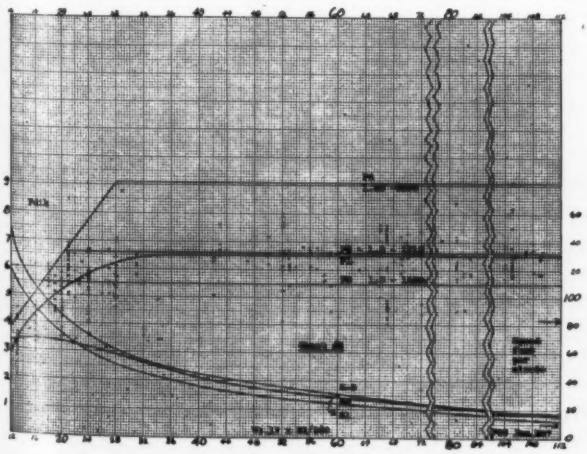

FIG. 3

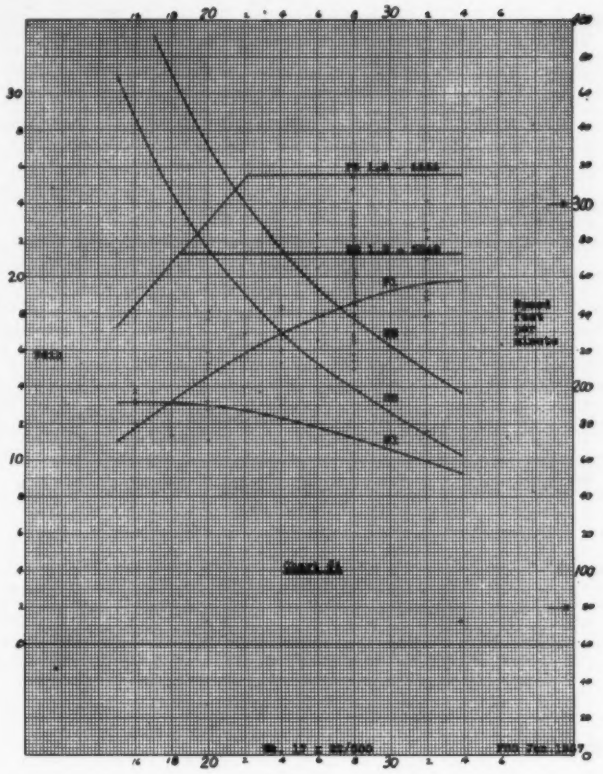

FIG. 4

stock will dry at rates equivalent to what may be secured on the so-called "free stock papers".

Referring to this chart, it will be noted that the range of weights is from 12 to 109 pounds (17 x 22/500). A weight of 109 pounds is equivalent to a board of 18 to 19 points thick. The variation in weight from lightest to heaviest is a little over nine times.

It will be noted that the average production curve P1 drawn through these points shows a gradual rise to approximately 28 pounds and from 28 pounds to a maximum of 109 pounds the curve is a horizontal line at 6.5 Pdih. This machine shows the usual variations in production rates at almost all of the various basis weights run, and it is equally evident that this average production curve P1 could be appreciably increased. In other words, this machine while it has a record of having produced at extremely high production rates, on the average it has not maintained as high a rate as is possible.

Fig. 3 is especially interesting as the average production rate curve P1 is practically at the level of curve P3. Curve P3 is based on a drying rate of 1.2 pounds of paper per square foot of drying surface per hour. The large number of dots above this P3 curve is proof that the drying rate of 1.2 pounds per square foot of drying surface per hour is not excessive. This is further substantiated by noting the high Pdih values at 52, 61, 81, and 105 pounds (17 x 22/500).

Explanation of Fig. 4

Fig. 4 is extremely interesting. It represents a sulphite bond machine trimming over 110 inches and producing only sulphite papers for bonds and envelopes. First glance at the average curve shows that this machine never reached its full production. This is further borne out by the fact that the 28-pound weight was made at rates that range from 8.3 Pdih to as high as 25.5. This means that the

lowest record of production on a 28-pound folio weight was one third of the maximum at which the machine has operated, and less than one half of its normal operating production rate. A very few mechanical changes on this machine plus a knowledge of what is its true production rate has enabled this machine to produce all weights above 20 pounds 17 x 22/500 at more than 24 Pdih and this has resulted in a material reduction in costs for labor and overhead.

Explanation of Fig. 5

Fig. 5 is interesting as representing a machine making the very highest grades of all rag bonds, with a quality of product well known on the American market. This machine for a number of years operated at production rates much below its capacity. The chart shows that 20 pounds (17 x 22/500) varied in production rate from 3 to 7 Pdih, and that 24-pound (17 x 25/500) varied from 4 to 9.2 Pdih. This same machine today is operating at a production rate that is well up to its capacity.

Fig. 6 is one of the most interesting of all. For over four years this machine made the same grade of paper (all wood envelope). About 95 per cent of this time it made one weight—26-pound (17 x 22/500) paper as shown on the chart. The operation of this machine was almost as continuously on one grade as a newsprint machine in the manufacture of newsprint paper. By referring to the chart it will be noted that 26-pound (17 x 22/500) paper varies from 9.2 to as much as 21.8 Pdih with an average of 15.0 Pidh. Based on an average production of 1500 pounds per hour, this machine varied from a minimum of 920 pounds per hour to as high as 2180 pounds per hour, and on the same stock, same basis weight and same trim. Even with all this variation in production rate, it is noted that the machine exceeded the P3 curve, the highest rate

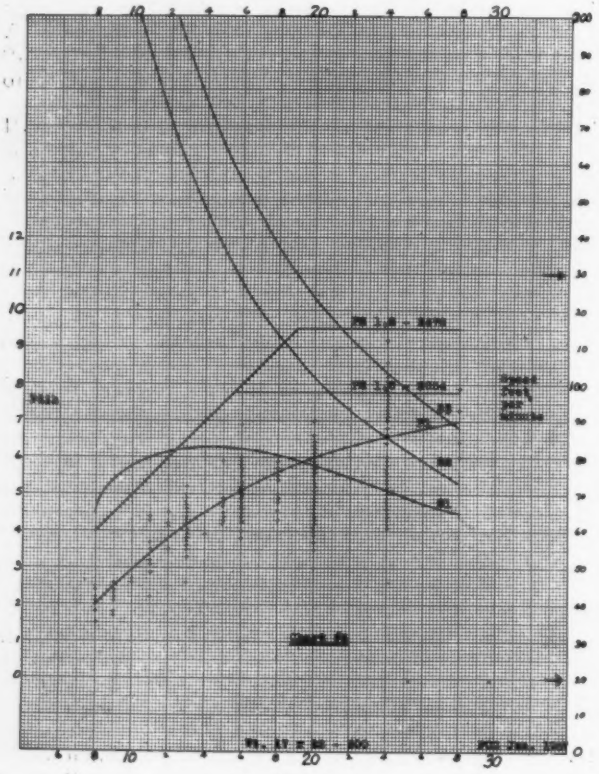

FIG. 5

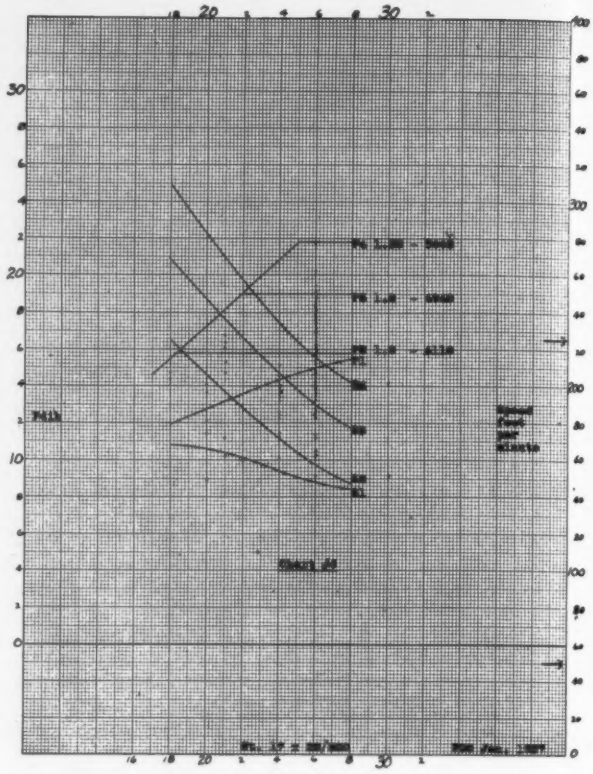

FIG. 6

at 21.8 Pdih being equivalent to the drying of 1.38 pounds of paper per square foot of drying surface per hour.

In this study of machine production rates, particularly in connection with the important study of determining what must be done in an old paper mill to put it on a paying basis, it is surprising how little extra production is required in many cases to eliminate actual losses. The elimination of unnecessary down time for repairs, breaks, and mechanical difficulties, plus a small speeding up in production frequently will change unprofitable production into very definite profitable results.

Many mills think first of quality and then more or less incidentally of production and fail to appreciate that their one sole purpose is to produce dollars. The management in some mills must learn to talk to his operating staft in terms of the production of *dollars*. He should point out first that with certain definite fixed charges, certain definite labor costs and other items of expense, plus the cost of raw materials, requires that each operating unit must produce at not less than a predetermined rate in order that the final product is plus *dollars*. It then becomes the duty of the engineering department to put these operating units into condition so that they may operate at these predetermined rates and then maintain them in this condition. It next becomes the duty of the operating department to maintain the operating rates that are required to produce the *dollar* returns, set as a standard. All of this does *not* mean neglecting quality, because the successful mills are producing the quality that is required by the trade, and at rates that will enable them to make a profit, although these rates may be suicidal for the inefficient mill.

All of this may sound elementary, but it is the little elementary things in a paper mill which may change losses to profits, especially in these days when the low cost mill sets the pace for all other mills. The production of dollars is the one important thing in any paper mill, while the pro-

duction of paper or board is secondary. The study of machine efficiencies is important as it shows what production rates can reasonably be expected and what production rates are required to make a profit on any particular grade. This information cannot be determined without a thorough knowledge of machine operating conditions.

DISCUSSION OF PAPER MACHINE CONDITIONS

It is not expected that it will be possible to increase production on a paper machine immediately, but part can be accomplished by definitely setting the speed for each basis weight, and then adhering rigidly to it. Weak spots will develop, but by a careful study of the performance of each machine these may be remedied and the speeds gradually increased.

Driers

It is my opinion, based upon the examination and study of many paper machines, on all grades of paper and board, that the principal limiting factor in production is in the drying part of the machine. Driers must be kept in good condition, siphon pipes must be tight and bent to within at least one half inch of the inside bottom of the drier and of course must be in a vertical position. Discharge from drier siphons must not be clogged in any way with valves, traps, or anything else that prevents the free discharge of condensate. Wherever possible it is advisable to discharge these siphon pipes through a vertical pipe outside the drier extending 3 or 4 feet or more below the bottom of the bottom drier. This gives slight additional suction on the discharge line which helps to promote easy removal of condensate.

The outside surface of the driers should be kept at the highest possible degree of polish. A very small amount of pulp particles adhering to the surface of a drier will reduce the drying capacity 75 per cent or more. This means that with four driers in this condition, it is equivalent to taking three driers entirely out of service. These figures are not guess figures or figures that have been calculated, but are from actual data determined from a series of very extensive tests of paper machine driers.

Many paper mills fail to give the required attention to the moisture content of their paper and as a result their paper is too often overdried. This overdrying makes a paper difficult to handle in the printing press room. Papers of over 7 or 7½ per cent moisture content will print much better than when dried to 2 or 3 per cent. Many mills have increased their production by as much as 5 per cent by not overdrying the paper. The installation of suitable drying control equipment that will insure the higher moisture content will therefore pay a large return on the investment.

Ventilation

Adequate ventilation is very important, particularly when it is recognized that every pound of paper produced means the evaporation of approximately 2 pounds of water, and that 1400 cubic feet of air are required to carry off this amount of water vapor.

Efficient ventilation may be secured either by natural draft with properly designed hoods or ventilators, or by the installation of hoods and mechanically driven exhaust fans. The installation of a hood and fans is the more positive and in many cases is the only means by which the excessive condensation of moisture on roofs may be eliminated. Wet roofs will rot out in less than half of the normal life of a machine room roof where adequate ventilation is provided. Wet roofs means a continual drip of water, which spoils paper and equipment and too often ruins an operator's disposition. Proper ventilation is a real saving in dollars to any paper mill.

Drier Felts

Felt conditions are very important. A drier felt if kept on the machine too long, to the point where it has a hard, non-absorbent surface and where the felt cannot be drawn tight enough to cause it to hug very tightly to the drying service, will result in poor drying conditions with increased steam consumption and reduced drying capacity of the machine.

Press Felts

Old or dirty press felts or felts which have lost their water absorbency as well as imperfect crowns on press rolls have a decided influence on the removal of water at the presses. Studies made by felt manufacturers have shown large variations in the water removal capacity of felts resulting from the variations in machine conditions, and regardless of the character of the stock being run on the machine. Very few paper mill executives appreciate the tremendous difference in steam consumption caused by slight variations in water removal. Even one or two per cent in moisture content of the paper entering the driers will cause large differences in the capacity of the driers.

It is essential that frequent tests be made and suitable records kept of the amount of water per pound of air-dry paper at various places throughout the paper machine. These records should include information from various locations and be expressed both as per cent moisture and as pounds of water per pound of air-dry paper or fiber, all on an air-dry basis.

At the wet presses, frequent samples should be taken at the "front", "middle", and "back" of a sheet and their moisture content determined. This tells if felts and rolls are in good condition and are uniformly weighted. It also tells when press rolls should be reground, whether roll crowns are correct, and many other details which enable a mill operator to know the facts and not guess. Knowing the facts makes it possible to do the right thing to correct a difficulty. Guessing at a cause results too often in guessing wrong, and "correcting" the "wrong" thing never remedies the condition that is the real cause of the trouble. Today's competition does not permit "guesswork" and "profits" to exist in the same mill.

Records

The successful operation of any paper machine requires complete records of performance as to speed, weight, trim, and details of the cause of down time. Records of speed and down time can only be obtained by the use of a suitable continuous recording speedometer between the driers and the calender stack. An instrument of this kind records speed in feet per minute and shows every break that occurs up to the reel. From these charts may be calculated the actual productive time and the difference between this and the total time for the day is a true measure of lost time. The installation of such equipment on any paper machine will show that previous down time records have been greatly underestimated. Management, of course, cannot improve these down time conditions without first knowing what they are. It is also important to maintain a close check of the actual basis weight and from these figures of actual basis weight together with data for speed, operating time, trim, and so on, make it possible to calculate both the theoretical and the actual production. These records should be calculated for each machine and for each tour, in fact, such records should also be calculated for each lot or grade of paper produced.

The keeping of records is very essential and will if used, result in more efficient operation of your paper machines. The present lack of data makes it impossible to intelli-

gently direct their operation. Oftentimes the operation of a paper machine seems to be mysterious, but there is no mystery about it if the necessary data are available.

Let us again emphasize the importance of efficient pressing at the wet presses. A recent moisture test of the paper entering the driers showed 66 per cent moisture on one machine and 61 per cent moisture on the other machine. This means that the sheet having 66 per cent moisture content contained 1.94 pounds of water per pound of air-dry paper, while the sheet of 61 per cent moisture content contained 1.565 pounds of water per pound of air-dry paper. The difference between 1.94 and 1.565 is 0.375 pounds of water, or one sheet had 750 more pounds of water per ton of paper than the other. The paper of higher moisture content required the driers to evaporate 24 per cent more water and resulted in slowing the driers to 80 per cent of the speed they could run at the lower moisture content. This one illustration shows why it is important to continuously watch the action of the presses and keep them in perfect condition. It is far cheaper to press out water than it is to evaporate it.

8. Cost Control

The true measure of any manufacturing operation may only be secured by the determination of cost per unit of product. Suitable quality of product is important in order that it may be sold, but quality is secondary to its unit cost. Most paper mills lay great stress on the quality of product and fail to give sufficient study to unit cost. The unit cost of a product is management's truest yardstick for measuring manufacturing operation. The use of such a yardstick will tell when equipment or processes are obsolete and must be changed to meet competition. By cost control, management can set up the required production rates that will insure profits; lack of cost control too frequently results in serious loss.

The most essential part of the management of any paper mill organization is its cost finding department. It is the function of a cost department to point out those orders that are unprofitable. Management must then study manufacturing operations to determine whether this condition of high cost can be overcome, and if so, to say how this shall be done. If raw material costs cannot be sufficiently reduced, it is, of course, obvious that production must be increased to a point where the loss will be eliminated.

The above method should be followed in making a mill survey, which will point out what the manufacturing department is capable of doing if the equipment is put into first class condition and kept that way, and if operations are based on sound technical information and not on guess-work.

9. Proposed Improvements and Advantages

A thorough study of the entire plant and its facilities and layout for doing a particular job will point out many opportunities to improve conditions, reduce costs, and secure economies as a result of certain definite expenditures.

Each of these items of expenditure for improvement should be carefully set forth, listing in detail the work that is to be done, the cost of this work, and opposite the cost should be an estimate covering the advantages to be derived with the probable time for the amortization of this expense. Setting forth this information in detail makes it possible for management to discuss each item with his operating and engineering staff in order that everyone may be convinced of the importance of the undertaking and the benefits that will result.

Clean-up of plant. In many plants that have been operating at little or no profit there is a tendency to become slipshod and careless. This results in the accumulation of waste and rubbish which should be collected and removed. All mechanical parts such as pulleys, valves, piping, etc. should be salvaged for re-use and stored in a suitable location. Appreciable savings can be made in almost any plant by the installation of a suitable salvage department. Such a department will return to the storeroom many pieces of equipment that otherwise would be discarded as waste.

The storage of machine "broke" is a problem in many mills, particularly where the production schedule calls for changes in grade, color, and furnish. A suitable storage space should be provided for such "broke" so that it may be kept clean and dry. If necessary to store broke in the basement, it should be stored in suitable bins and on platforms sufficiently high above the floor to keep it clean.

Liberal use of paint or even whitewash which can be made water-resistant is an advantage in any plant. A clean mill adds tremendously to the general morale of any organization.

General Maintenance. One of the first items of expense that is curtailed in an unprofitable mill is the cost for general maintenance. In many cases expenditures for maintenance have been reduced to such a point as to result in an actual loss due to excessive down time. Paper mills must be kept in good operating condition because the cost per hour is so high that even a small unnecessary amount of down time adds a tremendous burden to operation.

The successful operation of any paper mill requires the closest possible supervision of many minor details, all of which while apparently small, add up to an appreciable amount at the end of a year. Most paper mills use much more steam and water than is necessary. Large amounts of steam are used for heating water and stock where small amounts or none at all should be the rule. Water hoses are left running continually with the apparent belief that water costs nothing. This is not correct and all of these small wastes if long continued result in a careless attitude on the part of operators.

No attempt can be made to cite all of the possible items of improvement that may exist. Each mill is so different in this respect that the individual mill must be studied to bring out these points. In general, however, it may be well to point out that many mills could install a suitable pulping system for breaking up their dry pulps ready for the beaters and thereby increase their efficiency of operation, reduce their costs, and at the same time enable their present beaters to produce at greater capacity. A beater is not an efficient machine for pulping up dry pulp.

It is almost universal practice throughout the industry to operate beaters at extremely high densities or at densities that permit a very slow circulation. This is most inefficient. In fact, all beaters will operate at greater capacity if operated at their optimum consistency. In many cases it is possible to increase beating capacity as much as 25 per cent without any increase in horsepower consumption, if the density is reduced to the point where maximum production is secured. Each individual beater has a consistency at which it gives best results. This should be determined for each mill and the necessary directions be given to the operating staff to follow out these instructions.

10. Personnel

In general the personnel at any mill is of the type that may be depended upon; therefore, with proper instructions and with an understanding of what is required and why, it is seldom that any trouble is experienced in securing the greatest degree of cooperation in carrying out proposed equipment changes. Operators in general recognize that production must be increased, down time reduced,

and where these matters are explained, experience has shown that the operator will show a real interest in the welfare of the company.

Years of operating experience have taught us that the American workman looks on his daily job in the same way that he looks at an athletic contest. His natural instinct is to try to "beat" yesterday's record. Suitable direction and leadership enable him to accomplish this. A frank discussion of a mill's problems, plans, and the method by which these plans are to be undertaken will result not only in their full cooperation, but, most valuable of all, will result in many worthwhile suggestions from them that will be reflected on the profit side of the ledger.

Frequently there is a very distinct difference of viewpoint between management and the operating department. The attitude may best be expressed by stating that in effect at least management says to the operating department

> Here is a plant with buildings and equipment costing about a million dollars. We, the management will supply you with the raw materials. We will pay you some wages and it is our sincere hope that you will be able to run at a profit. We do not tell you what you must do to secure a profit; in fact, we do not tell you what we mean by a profit.

Management too frequently does not know, at least in terms that are understood by the operating department.

Under such conditions we find an attitude of operators toward management which might well be expressed by the following questions:

> What does management mean by operating at a profit?
> How do they figure profit?
> How can we know whether we are operating at a profit or a loss?
> If they are not operating at a profit, why don't they raise the selling price of their product?
> Why don't they fix up these things around the mill so that we can operate more profitably?
> Why don't they go out and find business for us that will enable us to run on one size, weight, color, trim, furnish, etc. continuously instead of giving us a lot of odds and ends of orders that mean endless work and changes?
> If they did not pay such high salaries for managers and salesmen and go out and sell paper for less than it costs, perhaps we might be able to make a profit.

The above questions are frequently heard around paper mills. This attitude of one department for another prevents the degree of teamwork that is so essential to the success of a company.

This situation can be remedied by supplying the key operating men with cost and production records. Such records serve as an incentive for continuous improvement. Some mills have made the mistake of making too many records, but a certain amount is very beneficial to a plant and where no records are given to operators, equipment is often found operating at 60 or 70 per cent capacity. These records of production, quality and cost properly presented to the key men, such as the superintendent, foreman, machine tenders, back tenders, beater engineer, and plant engineer enable each one of these individuals to set up his own target, and the result is a lowering of costs and increase in quality as well as quantity. At the same time it provides management with a continuous record by which they may quickly determine the manufacturing progress.

The majority of workers in any plant are much more interested in doing a good job than they are in doing a poor job. Lack of knowledge, however, of what is wanted, lack of standards, and lack of a target to shoot at, foster an attitude of carelessness. We feel that it is essential to change this attitude, to clean up the mill, which will raise the morale, and to make all the necessary repairs to equipment, particularly where lack of these repairs is adding to your operating costs.

Elimination of breakdowns makes the average job in a mill less laborious and a mill that can operate its plant with the least physical effort on the part of its key men, particularly machine tenders and back tenders, is insuring to itself a constant production, because when a paper machine is operating satisfactorily there is relatively little work to be done, and when the machine operators are exerting their greatest physical effort, the machine is not producing and the company is losing money.

Most mills today have a good safety committee, and where the work of such a committee is properly supervised and encouraged by the management, the results are highly beneficial to any company. It is rather interesting to note as a result of experience in many mills that safety programs do not go over by telling men to be careful for themselves. They seem to take the attitude that such suggestions tend to make sissies. Tell them, however, that accidents to men are too damned costly to a company and the men will then work like hell to save money for the company.

11. Sales

Lack of cooperation between Sales and Manufacturing too often exists in paper mills. Sales departments frequently have the belief that manufacturing any particular quality of product is merely a question of turning a few valves and that that is about all there is to it. This results in supplying the operating department with an insufficient amount of information in regard to customers' requirements, and the production of material not suitable for the customers frequently follows. The fault here is very definitely lack of appreciation of the information required by the operating department. The sales department, or at least a representative of this department should frequently visit the manufacturing department and learn just what information that department must have in order to meet each customer's requirements. Such visits of the sales department can be used advantageously in learning about the problems of the manufacturing department, and enable the sales department to explain why some customers have these special requirements. In this way it is possible to iron out many of the difficulties that exist between sales and manufacturing.

We recognize that in many lines of papers and boards selling prices have been set by the lowest cost mills with resultant losses to high cost mills. Sales departments in all mills frequently take small orders that are a serious burden to the manufacturing department. Short runs with many changes are a serious handicap to any mill. Whether such orders should be accepted at any time is entirely up to management. The manufacturing department however usually does not realize that these small orders while unprofitable as a whole may yet enable a mill to run and hold its operating personnel and pay part of its overhead. Refusal to accept such small orders might result in closing down a mill, thereby earning none of its overhead, and possibly losing its operating crew. It is better to run and lose $10.00 than not to run and lose $25.00.

The settlement of controversies between sales and manufacturing will always be one of the major problems of management.

Conclusions

Paper mills that have allowed themselves to reach the position where their operations are unprofitable will find that there are many factors that have contributed to this condition. Consequently no one or two changes in policy can overcome this condition. A thorough survey of a plant as has been outlined above will indicate what changes must be made. Business today is vastly different from what it was a few years ago, consequently old methods that were succesful in the past may produce only failure under these changed economic conditions.

Water Purification to Meet Paper Mill Requirements*

By A. S. Behrman[1]

The pulp and paper industry has at times been accused by some of its own members of not being sufficiently "water-minded." I am not certain that this self-imposed accusation is altogether just. It seems to me that there is a general appreciation of the two related facts that a ton of pulp or paper comes into intimate contact with a good many tons of water in the course of manufacture, and that, unless the quality of this water is suited to the purpose, the results may be quite unsatisfactory and unpleasant.

A fairer criticism, it seems to me, might be that a part of the industry does not fully realize that the art of water purification has not stood still, but has progressed by leaps and bounds, especially in the last ten years, making possible new standards of purity and quality not previously attainable. Many of the methods followed and water purification plants still utilized by some of the older mills are so obsolete that they simply cannot meet present-day requirements with the economy, efficiency and uniformity of modern methods and equipment.

There is no more forceful incentive to modern and efficient operation in any field than the formulation of high standards; and the standards of water quality in the paper industry must be kept high or the quality of the product and the consequent success of the entire enterprise suffer. By the formulation of such standards TAPPI will render a twofold service of tremendous value to the industry, not only in providing the proper guide posts and danger signals, but also in impelling mills with obsolete methods and equipment to modernize in self-defense.

Quite obviously, the standards of water quality are not the same for all types of products. A water that may be entirely satisfactory for making a rough brown wrapping paper may be quite unsuited to the manufacture of bleached pulp or fine writing paper. Dr. Schwalbe's paper, presented at this meeting has set forth in detail suggested standards of water quality for various types of pulp and paper manufacture. It will therefore not be necessary for us to discuss this phase of the subject further. The object of the present paper is to describe briefly the methods of water purification by which the attainment of these standards is most readily and economically accomplished. It is important to emphasize at the outset, however, that the choice of water purification methods is frequently influenced fully as much by the character of the product to be manufactured as by the nature of the impurities in the water.

The great majority of mills, both in the North and South, derive their water supply from surface streams, most of them more or less turbid, many of them colored. Accordingly, in our discussion here the removal of turbidity and color deserve most attention.

The Water Must Be Clear

For any type of pulp or paper, the water must be clear. This requirement presents no problem if nature has generously provided a plentiful supply of clear and sparkling water. If, however, as is usually the case, the water is turbid or cloudy with suspended matter, the art of water purification readily makes up for nature's deficiency.

The suspended matter usually present in water is in such finely-divided and colloidal form that clarification by simple settling is out of the question. Some types of silt, for example, require weeks to settle out with any degree of completeness; while still other types of colloidal matter will remain in suspension almost indefinitely. Such finely divided matter will also pass right through a sand filter. The solution of the problem is to collect these extremely fine particles into aggregates which are large and heavy enough to settle out or be retained by a sand filter. This bringing together process is known as coagulation. The three successive steps of coagulation, settling, and filtration are the essential features of any typical water filtration plant.

The most common coagulating agent used in water purification is aluminum hydroxide, a jelly-like substance that fastens around the finely divided particles of suspended matter and collects them into large and heavy aggregates. In actual water purification practice, the aluminum hydroxide is usually formed by adding to the water a small, predetermined dose of aluminum sulphate. The aluminum sulphate being acidic, reacts with the alkalinity of the water to form aluminum hydroxide. If the natural alkalinity of the water is not sufficient for the purpose, artificial alkalinity must be added in the form of lime, sodium carbonate, calcium carbonate, or the like.

The aluminum sulphate, or "filter alum," of commerce corresponds roughly to the formula $Al_2(SO_4)_3 \cdot 18H_2O$. The usual dosages required for coagulation range from about 0.5 to 3 grains per gallon, although dosages as high as 5 to 7 grains are sometimes necessary. A dosage of 1 grain per gallon reduces the natural alkalinity of the water by 8 p.p.m. (as calcium carbonate), and requires the addition of that much alkalinity if the natural alkalinity is deficient. A convenient factor to remember is that one grain per gallon is equivalent to 143 pounds per million gallons.

Practically all water purification plants of today are of the continuous type. The batch type is practically extinct. The aluminum sulphate is therefore added in fixed proportion to a continuous flow of raw water. In large plants it is customary to feed the alum in dry form, using dry feeders for the purpose. In smaller plants, and to meet other special situations, it is frequently more convenient to make up a tank of aluminum sulphate solution, and then feed this solution continuously by means of a solution feeder.

Some of the antiquated filter plants still being used in the paper and textile industries were built (and are still being operated) on the apparent assumption that all that is necessary to do is to add some alum to the water and let nature and the sand filters do the rest. Little attention, if any, is paid in such plants to the proper conditions for forming large and heavy flocs that will settle quickly and almost completely in the settling basin, leaving only a relatively tiny amount of coagulated suspended matter to be removed by the sand filter. In consequence of this lack of attention and facilities, it is frequently characteristic of the operation of these plants that proper coagulation is not

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obtained; the settling basins remove only a small part of the suspended matter; a heavy load is thus thrown on the filters, resulting in a turbid effluent, undecomposed alum, short filter runs, and excessive wash water. Large and expensive doses of aluminum sulphate are sometimes employed in an effort to overcome these conditions, but the results are not usually very satisfactory.

Possibly the most striking development in filter plant practice in the past ten years has been the vastly increased attention to the preparation of the water before sending it to the sand filters; and experience has amply demonstrated that proper preparation of the water prior to filtration more than pays for itself in better and more uniform quality of effluent, in reduced dosage and expense of coagulant, much longer filter runs, greatly increased useful life of the filters, and lower wash water consumption.

In the modern filter plant, the aluminum sulphate is not just added to the water, but is thoroughly mixed with and diffused through it. In the last few years "rapid mixers" or "flash mixers" have become popular for the quick and homogeneous distribution of the coagulant throughout the water. More than this diffusion, however, is required to attain the goal of effective coagulation, that is, the building up of large, rapidly-settling aggregates with the minimum dosage of coagulant. Formerly it was the general practice to attempt to accomplish this result by the use of baffled mixing basins of the "over and under" or "round the end" types. Within recent years, however, the tendency is towards much more effective types of mechanical coagulators and floc promoters. All devices of this sort function, with varying degrees of efficiency, on the same general principle, that is, they provide means for allowing the particles of suspended matter and coagulum to come in contact with each other repeatedly—something in the manner of a snowball rolling down hill, until flocculated particles of the maximum size are obtained. For the purpose of promoting floc formation, a contacting period of 15 to 30 minutes is commonly employed.

With the suspended matter thus coagulated into rapid-settling flocs, the water now passes through the settling basins at a very low velocity. The time of retention in these settling basins, to permit sedimentation of the coagulated suspended matter, varies a great deal with individual plant conditions, but ranges for the most part from a minimum of two hours up to a maximum of six hours, with an average of probably three or four hours.

When the amount of suspended matter is quite large, or where space is at a premium, one may employ rapid settlers or clarifiers of as little as one hour's retention capacity, and with continuous removal of the settled solids.

The settled water now passes to the sand filters, which remove the last of the suspended matter.

The suggestion is sometimes made that, if a water is properly coagulated and settled, it might be possible to dispense with the filtration step. Experience, however, does not support this suggestion. Aside from the fact that, even under the most favorable circumstances, a properly coagulated and settled water cannot be counted on to have the low turbidity required for pulp and paper work, the filter makes it at once possible not only to secure at any time the practically zero turbidity required for fine paper work, but also insures against slugs of turbidity from the settling basins that may arise from such wide variety of causes as strong winds, microscopic organisms and fluctuations in the character of raw water.

The optimum pH for the coagulation of suspended matter is important, particularly if the greatest economy of coagulant is required; and the optimum pH is best determined first by jar tests in the laboratory, supplemented by full-scale tests in the plant. There is considerably more latitude, however, in the pH of coagulation for the removal of suspended matter than there is for the removal of color, as we shall see very shortly.

While this discussion has emphasized the value of aluminum sulphate as a coagulant, other compounds are used to a lesser extent also. Among the most important of these are the iron salts, particularly the ferric compounds, used in place of aluminum sulphate; and sodium aluminate, an alkaline coagulant, which has no appreciable coagulating value when used alone, but which is a source of aluminum hydroxide when reacted upon by an acidic compound such as aluminum sulphate or equivalent substance. Time will not permit, however, a detailed discussion of these materials.

Color

Another desirable quality on which there is very little disagreement among paper men is that the water should have a low color. Here again the exact value of the maximum permissible color depends a great deal on the product being made. Since the color of water is the yellow or yellow-brown arising from the organic matter with which the water has come in contact, it follows that the maker of brown wrapping or bag paper can frequently "get by" with high colors that would spell disaster to bleached pulp or writing paper. A color of 10 is generally considered to be reasonably satisfactory for nearly all types of pulp and paper manufacture, although the figure of 5 suggested in Dr. Schwalbe's report is obviously more desirable when attainable. It is usually, but not always, possible to reduce the color of even a very highly colored water to 5-10 by proper chemical treatment.

The simplest and cheapest way of removing color is by coagulation, as the color is due to extremely finely divided colloidal organic matter, so fine, in fact, that a water may be as highly colored as dark beer and still be almost perfectly clear.

Coagulation for color removal is an adaptation of coagulation for the removal of other types of suspended matter; but it is a much more precise operation and one requiring a great deal more accurate adjustment. This is particularly true of the pH for optimum coagulation. Uncolored waters containing mud, silt, or the other usual types of suspended matter may be fairly readily coagulated with a coagulant such as aluminum sulphate over as wide a pH range as from pH 5.5 to 7.5. For the satisfactory coagulation of colored waters (the color of which, for example, may run anywhere from 30 or 40 up to 200 or 300) there is frequently only a very narrow pH range in which good floc formation will occur even with a large dose of coagulant. Quite often, this pH is surprisingly low; we have seen a number of such cases where the optimum pH is about 4.8. In cases of this sort, if the alkalinity of the water is not fairly low to start with, it is sometimes more economical to dose the water with a combination of sulphuric acid and aluminum sulphate, instead of aluminum sulphate alone, to produce the desired low pH.

As in the case of other types of suspended matter, coagulation for color removal is aided very materially by adequate mixing and contacting for the promotion of floc formation. The coagulated water is, of course, settled and filtered, as before.

In a paper read before this Association several years ago, *(1)* it was shown that the coloring matter in water is negatively charged, a fact which explains in part at least the coagulating power of the trivalent aluminum and ferric ions.

Other methods of color removal are also sometimes re-

sorted to. Some of the color-producing organic compounds can be destroyed by oxidation with chlorine. In special cases we find it advantageous to use chlorine in excess for this purpose, subsequently removing the excess chlorine by passing the clarified water through granular activated carbon. We have found this chlorination treatment especially efficacious when used in connection with a coagulant such as aluminum sulphate, or the combination of aluminum sulphate and sodium aluminate. Activated carbon alone will usually remove the color from water quite completely; but its color absorption capacity is so limited, and the carbon becomes saturated so quickly with the color that it has removed, that the employment of carbon alone for this purpose is not usually economical.

Since the color of water is almost always due to organic matter, it follows that the removal of the color automatically reduces the amount of organic matter. Generally speaking, we may say that when the color of a water has been reduced to 5 or 10, the amount of residual organic matter, as measured by the permanganate oxygen consumption test, will meet the standards suggested in Dr. Schwalbe's paper.

One other fact about the color of water (particularly the low colors in treated waters) deserves mention. As was pointed out in the paper just referred to, the color of water may be affected appreciably by the pH, being generally lower with low pH, and increasing if the pH of the water is increased. This fact should be borne in mind in such cases, for example, as those in which the coagulation for color removal is conducted at pH 4.8, and the pH of the treated water is subsequently increased considerably for the prevention of corrosion, or for other reasons.

Danger of Corrosion with Low Alkalinity and pH

It follows from what has been said of coagulation for the removal of suspended matter and color that the alkalinity and pH of the treated water may both be quite low, so low, in fact, that it is really surprising that there are not more complaints of corrosion of distribution systems in paper mills than apparently seems to be the case, since many of them do not increase the pH before sending the water to the distribution system. Where, for any reason, it is desired to increase the pH and alkalinity of the water, this may readily be accomplished by addition of the proper amount of appropriate alkali, preceding the feed of alkali by aeration to remove free CO_2 if the situation warrants. When protection from oxygen corrosion of the distribution system is the chief consideration, the alkali fed should usually be lime, in order (if other conditions permit) to saturate or preferably slightly supersaturate the water with calcium carbonate and thus tend to deposit a protective film of this compound on the metal surfaces.

Iron and Manganese

Both iron and manganese are highly objectionable, out of all proportion to the tiny amounts involved. There can be no disagreement with Dr. Schwalbe's suggested specification that the iron content of the water should be not over 0.2 p.p.m., and preferably not more than 0.1 p.p.m. and the manganese content of the same order or even less. The rusty "iron" spots of ferric hydroxide are familiar to all, and easily recognizable as such. The blackish-brown stain of manganese dioxide is probably not so familiar.

Iron-bearing waters are for the most part ground waters, that is, from wells or springs, and devoid of oxygen. The iron is present in the ferrous conditions, usually as ferrous bicarbonate. Such waters are usually quite clear when first drawn, but soon become opalescent and discolored on exposure to the air, and eventually deposit the familiar rusty sediment of ferric hydroxide.

The simplest and cheapest way of removing iron from such a water is to aerate and filter it. Aeration introduces the oxygen necessary for oxidation, and frequently, through removal of free CO_2, increases the pH and so accelerates the oxidation of the ferrous iron to the ferric condition, whereupon it hydrolyzes and forms the insoluble and familiar red-brown ferric hydroxide. If the amount of iron is large, it is usually desirable to provide a settling basin to remove most of the precipitated ferric hydroxide before sending the water through a sand filter to remove the remainder. Occasionally, also, a small dose of a coagulant or an alkali (usually lime) is employed to facilitate the coagulation and precipitation of the ferric hydroxide.

There are several other types of iron removal processes, such as those employing manganese zeolites, iron removal minerals of various sorts, and other expedients. Such special processes have a limited, though useful field. We will not discuss them here in detail, however, simply because a paper mill can almost always utilize the much more economical method of aeration and filtration.

Manganese resembles iron sufficiently in certain of its chemical characteristics to have caused a great deal of trouble by leading to the assumption that the same methods can be utilized for removing manganese as for iron. The assumption is entirely incorrect. We have just stated above that soluble ferrous iron can usually be readily oxidized by the oxygen of the air to insoluble ferric hydroxide. Soluble manganous manganese cannot be oxidized to the insoluble manganic or higher form by aeration. Manganese is much more difficult to remove than iron, the exact method to be employed depending a great deal on the other characteristics of the water and the treatment which these other characteristics make necessary. If the water is to be softened with lime, for example, the manganese is automatically precipitated and removed in the process. Other methods include precipitation with chemicals, and contacting the water with manganese zeolites, and with various types of catalytic minerals. As pointed out previously, the selection of the proper method is a problem requiring careful consideration of all the local conditions involved; and no blanket recommendation can be given.

Hardness

Until the past few years, the hardness of the mill water supply was frequently the cause of considerable discussion, but of very little genuine concern. One of the most important factors in upsetting this rather complacent attitude is the steadily increasing importance of alkaline digested pulp, particularly kraft. An appreciable amount of alkali is, of course, retained by the pulp; and if the water used for washing the pulp and for distributing it from the head-box is even moderately hard, the sodium hydroxide and carbonate in the pulp will do a pretty good job of water softening. The resulting precipitate of calcium carbonate and magnesium hydroxide can usually be counted on to come down as a grayish-white sediment, causing both off-color and spotting, with the further bad effects that the paper will tend to take size and color unevenly.

As is well known, there are two principal types of water softening processes, the lime-soda process and the zeolite process. The lime-soda process is based on precipitation, in which the calcium and magnesium of the hard water are precipitated as calcium carbonate and magnesium hydroxide respectively. The process consists essentially of adding the proper amount of chemicals to the water in accurate and predetermined proportion, mixing thoroughly, allowing the precipitate to settle, and filtering the supernatant settled water through a properly designed sand filter. The principal chemical characteristics of a typical water softened by the lime-soda process are high pH, low

alkalinity, and, typically, a greatly reduced total solids content due to the bodily removal of the calcium and magnesium bicarbonates originally present.

In the zeolite process, the hard water is passed through a bed of insoluble material which has the remarkable property of exchanging its sodium content for the calcium and magnesium of the hard water. As a result, the calcium and magnesium compounds of the raw water are replaced by the corresponding sodium compounds; and, conversely, the sodium zeolite becomes a calcium and magnesium zeolite. When this exchange of bases has reached a practical limit, the "exhausted" zeolite is now "regenerated" by passing through it a solution of sodium chloride (common salt) which drives out the calcium and magnesium that has been taken up from the water, replacing them with a fresh supply of sodium. The excess brine is now washed out, whereupon the rejuvenated sodium zeolite is ready to soften more water. The softening and regenerating processes can be repeated, as a rule, hundreds of times before the material needs additions or replacement.

The characteristics of a zeolite-softened water are "zero hardness," no substantial change in pH or alkalinity, and no reduction of dissolved solids.

This comparison of the chemical characteristics of waters softened by the two processes will give fairly good indication of the preferred fields for each method. A choice between the two methods depends not only on these chemical characteristics, but also on a number of other considerations, such as installation and operating cost, local engineering conditions, and the characteristics of the raw water other than the hardness. In the last-named connection it should be noted that since the lime-soda softening process involves chemical mixing, settling, and filtration, the process is generally selected without much question when the raw water contains appreciable amounts of suspended matter. Incidentally, also, lime-soda softening removes iron and manganese simultaneously with the hardness, besides providing an effluent that is non-corrosive to iron pipe. The principal advantages of the zeolite softener, on the other hand, are its somewhat greater simplicity of operation, the fact that a zeolite softener can be operated under pressure, if desired, and the characteristic already mentioned that a properly operated zeolite softener can produce water of real "zero hardness" from most types of raw waters, whereas the effluent from a lime-soda softening plant is rarely less than 2 or 3 grains per gallon, though in many cases, it is only fair to add, a hardness of 2 or 3 grains is just as satisfactory for the purpose as "zero hardness," and is preferable from some other aspects, such as the corrosion of iron pipe.

Alkalinity

The alkalinity of a water used in pulp and paper making is of importance principally if it is due to calcium and magnesium bicarbonates (in other words, carbonate hardness) as this alkalinity will form a precipitate of calcium carbonate and magnesium hydroxide with the residual alkali from the kraft and soda processes, besides having the objectionable affects on sizing, dyeing and the like described in Dr. Schwalbe's paper. Alkalinity due to sodium bicarbonate in the water is not considered to be highly important, although the presence of large amounts of this type of alkalinity may require the use of a little more acid for the proper pH adjustment.

pH Adjustment

It is now possible to control the pH of the water supply of the mill automatically and within as narrow limits as is desired. This is equally true it the pH is to be increased, as in the prevention of oxygen corrosion of iron pipe, or if it is to be decreased, as a preliminary to sizing or other operation in the mill. The method consists in general in measuring the potential difference (which may be calibrated directly in pH) across two electrodes submerged in the water and then, by means of a self-balancing null type potentiometer provided with appropriate maximum and minimum limits and contacts drive suitable acid—or alkali—feeding devices that will make the desired pH adjustment.

Chlorination

Chlorination in the paper industry, especially for slime prevention has become so common that it seems scarcely worth while giving this topic more than simple mention. For slime prevention it is now considered good practice to maintain a residual chlorine content of about 0.5 p.p.m. The use of ammonia or an ammonium saft (such as ammonium sulphate) in conjunction with the chlorine, to form chloramine, makes it possible to maintain this residual much longer than if chlorine alone is employed. It is interesting to note that Henderson has recently patented (2) the chloramine treatment of pulp and white water.

Odors

Occasionally, though rarely, we find a water with a disagreeable odor so strong that it carries through to the finished paper. In such cases activated carbon is the practically infallible remedy. It is employed either in the form of a fine powder added to and subsequently removed from the water, or as a granular bed through which the water is percolated. *(3)* Superchlorination prior to treatment with carbon is frequently very advantageous; but decision as to its value, like the choice between the use of powdered or granular activated carbon, depends on a careful analysis of all the conditions involved.

Cost of Chemicals for Water Treatment

The item of cost is always one of interest and importance. The cost of chemicals for coagulation and color removal will usually range from a minimum of about ¼ up to a maximum of about 2 cents per thousand gallons. Where water softening is required, the cost of chemicals will vary, of course, in proportion to the hardness of the raw water. Bearing in mind both the suggested standards given in Dr. Schwalbe's paper, as well as the character of the water supplies most likely to be encountered, the cost of chemicals for water softening will range for the most part from about 1.5 to 5 cents per thousand gallons.

Conclusion

How can we best summarize this discussion? Probably we can do no better than to repeat and elaborate a little on the thought in the closing paragraph of Dr. Schwalbe's paper, that is, that the mill needs a water supply that is clear, low in color and organic matter, practically free from iron and manganese, and having certain other desirable chemical characteristics. Fortunate and rare indeed is the mill that is blessed with a natural supply of a water of this sort; but deficiencies and imperfections in the natural quality of the water can now be remedied by the modern methods and equipment which the advancing art of water purification has made available in the past few years.

A corollary thought which we have tried to bring out in this discussion is that the new multiplicity of high standards of water quality, and the multiplicity also of water purification methods for attaining these standards are so intimately linked with individual mill conditions that a

careful study both of the water in question and of the conditions under which it is to be used must of necessity precede an intelligent program either of modernization or of more efficient utilization of facilities already existing.

Literature Cited

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Concerning the Interpretation of Pulp Tests*

By James d'A. Clark[1]

Abstract

The importance of the effect of ultra fine materials in pulps which is usually lost during testing, is discussed and its marked effect, particularly on freeness measurements is shown. The satisfactory correlation of various freeness testers on this account appears impossible.

The specific volume of test sheets, is shown to be an extremely important modifying factor for test results in general and, with its aid, a much better understanding of true pulp qualities can be gained than with test results as usually presented.

Despite the welter of new testing methods and new tests for pulps which have been developed during the past thirty years, there is no very clear idea in the minds of many, as to what real significance the results possess. Several formulae have been published in which attempts have been made to conglomerate mathematically a number of factors, usually burst and tear and sometimes breaking length, into a result called "value" or "strength factor," or a "general strength factor." The interpretation of the individual tests seems sufficiently difficult without having them jumbled together, because while such composite factors may, in a general way, signify the quality of a given type of pulp, attempts to provide a single quality figure are no more rational than an evaluation of a man's well-being by (say) adding his wealth, divided by 100, to the number inches round his waist and dividing by his blood pressure plus half his age.

Effect of Ultra Fine Materials

In the making of test sheets an important factor, which appears to have escaped the attention it deserves, is the percentage of the stock which is lost through the wire, especially if the stock is well beaten and lightweight test sheets are made and more especially when using very dilute stock and a coarse forming wire. This is a particular factor when a fine groundwood or a similarly finely divided pulp is formed into test sheets, as even using the standard 150-mesh wire this loss, for very fine pulps may amount to as much as 10 per cent, which is far more than the loss which may be expected in a mill having an efficient white water recovery system. In the making of lightweight test sheets in the laboratory, corresponding to tissue or thin papers, this loss may amount to well over a tenth of the added stock and, unless this fine material is returned to the sheet by means of a suitable recovery system, very misleading results will be obtained.

The magnitude of the influence of this fine material may be seen in Tables I and II.

TABLE I.—CLASSIFIED FRACTIONS OF FINE GROUNDWOOD

Test	Whole Pulp *	Fraction: On 20 Mesh	On 35 Mesh	On 150 Mesh	Through 150
Fraction (per cent)	100	7.7	15.4	31.9	45.0
Specific volume	2.22	2.86	2.78	2.68	....
Burst factor	16.9	9.4	9.7	10.2	....
Breaking length	3250	1810	1830	1870	....
Tear factor	39	45	43	42	....
Drainage time	51.0	5.2	5.2	5.5	....

* Because of loss through the wire during sheet forming, this is actually about 90 per cent of the whole pulp.
Note the tremendous influence of the ultra fine particles, particularly on the drainage time.

TABLE II.—CLASSIFIED FRACTIONS OF UNBEATEN UNBLEACHED SULPHITE

Test	Whole Pulp *	Fraction: On 20 Mesh	On 35 Mesh	On 65 Mesh	On 150 Mesh	Through 150
Fraction (per cent)	100	55.3	16.3	11.9	6.5	10.0
Specific volume	1.72	2.00	1.72	1.70	1.67	....
Burst factor	19.6	15.6	18.7	13.8	9.9	....
Breaking length	3410	2730	3270	2735	2185	....
Tear factor	122	133	117	88	39	....
Drainage time	5.1	5.1	5.1	5.1	6.0	....

* Because of loss through the wire during sheet forming, this is actually about 98 per cent of the whole pulp.

It is quite clear, upon examination of the above tables, that especially for the groundwood, the properties of the whole pulps are profoundly and beneficially influenced by material so fine that it passes through a 150-mesh wire, and the properties of the intermediate fractions are surprisingly similar. The very finest material, or flour, which commonly used to be held to be undesirable, proves, in most cases, to be very valuable.

The following experiments show the effects of a partial replacement of the fines lost in the white water of beaten unbleached sulphite during the standard sheet forming procedure (T 205 m-36) on standard weight sheets (60 g. per sq. m), by saving the white water from the first set of sheets, allowing it to settle and dividing the thickened stock into equal portions, which were added individually to the portions of pulp for another set of the same number of sheets. The beaten stock also was classified in the Thwing-Clark instrument and sheets were made from the fractions retained on the 35 mesh screen and on the 150 mesh screen.

TABLE III.—EFFECT OF FINES ON BEATEN SULPHITE
(Unbleached Sulphite beaten to 32 r.p.g. in a Clark Kollergang)

	Whole Stock No White Water	Whole Stock Plus White Water	55.1 Per Cent Stock On 35 Mesh	36.3 Per Cent Stock On 150 Mesh
Basis weight	61.8	62.4	58.8	60.5
Specific volume	1.22	1.24*	1.36	1.28
Burst factor	53.2	53.0	56.3	47.6
Breaking length	8820	8580	8330	7440
Tear factor	84	87	121	87
Drainage time	9.1	11.3	5.6	5.6

* The specific volume of sheets made with white water is really less than that shown, because of dirt particles having been included in the sedimented fines.
The weight of fine pulp recovered and added to each sheet was 0.054 gms. or 4.5 per cent of its weight.
19.6 per cent of the stock was lost through the 150 mesh wire.

In this example, as the stock was previously well beaten, the addition of the lost fines, as might be expected, did not have very much effect. It is quite obvious however, that

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amongst the 19.6 per cent of stock lost through the 150-mesh wire in the classifier, (the forming wire on the sheet machines is also covered with 150-mesh wire), practically all that portion of the stock was lost which mainly contributes to the slowness of the pulp. This, too, was the factor that was the most influenced by the addition, or rather replacement, of the 4.5 per cent of fines from the white water, as may be seen from the results in the second column of Table III.

The effect of the ultra fine particles on the same pulp, but only very lightly beaten, is interesting, especially by comparison.

TABLE IV.—EFFECT OF FINES ON LIGHTLY BEATEN PULP
(Unbleached Sulphite beaten to 4 r.p.g. in a Clark Kollergang)

	Whole Stock No White Water	Whole Stock Plus White Water	65.2 Per Cent Stock On 35 Mesh	27.5 Per Cent Stock On 150 Mesh
Basis weight	60.0	61.4	60.8	58.8
Specific volume	1.42	1.39	1.52	1.43
Burst factor	41.3	40.1	39.9	32.9
Breaking length	6270	6970	5930	5550
Tear factor	108	115	157	94
Drainage time	5.1	5.2	4.2	4.8

*With this lightly beaten pulp only 7.3 per cent of the stock was lost through the 150 mesh wire.

Here it will be seen that the addition or replacement of the small percentage of fines in the white water has quite a beneficial effect on the original pulp. Confirming the results in Tables II and III, the addition of fines causes an appreciable increase on the tear.

Application of Laboratory Results to Mill

When we consider what happens in the paper mill, it becomes apparent that we have to exercise considerable caution in translating laboratory results directly to mill conditions. In a well run mill with proper white water recovery facilities, the actual white water (not wasted stock, etc.) leaving the mill, should contain less than 0.7 pounds of fiber per 1,000 gallons and, with say 15,000 gallons of water used per ton of paper, this loss amounts to not more than about 10 pounds of fine material per ton, or 0.5 per cent, as compared with a minimum loss of about 4 per cent to over 10 per cent of beaten stock when made into sheets in the laboratory. It is quite obvious for example, upon study of the figures given in Table I, that it would be extremely rash to predict the running qualities of a rotogravure sheet made from substantial quantities of this fine groundwood stock, when 10 per cent of its finest material is lost during testing. Furthermore, considering that on the paper machine, from 15 to over 40 per cent of the stock passes through the wire and is returned to be mixed with the oncoming stock to flow again on to the machine, an accurate estimation of the slowness of the stock on the machine wire, which is based on the freeness or the drainage time readings of its component pulps, is obviously almost impossible. The best that can be hoped for with usual methods, is merely an indication.

Comparison of Freeness Testers

The loss of fines through the rather coarse perforated plate (0.020-inch holes) used in the Canadian freeness tester, under certain conditions, similarly may give very misleading results. The Schopper-Riegler uses a wire screen having a mesh of about 60 x 80 to the inch and is not affected to quite the same extent. As an extreme example, in specimens of groundwood made from southern pine by successively decreasing the rate of grinding by dulling the stone, the resulting pulp comprised largely of short fibered stubby flour mixed with coarse fibers and gave the following results when tested in a Schopper-Riegler, a Canadian standard freeness tester and for the drainage time in the British standard sheet machine, all acocrding to standard methods.

TABLE V.—RELATION OF FREENESS TESTS ON SPECIAL GROUNDWOOD

Sample No.	S-R Freeness cc. (free water)	Canadian Freeness (cc. free water)	Drainage Time Secs.
1	95 (90.5 deg. S-R)	56	98.0
2	115 (88.5 deg. S-R)	58	85.2
3	140 (86 deg. S-R)	58	71.1
4	285 (81.5 deg. S-R)	57	52.8
5	260 (74 deg. S-R)	115	12.4

The Canadian freeness tester is clearly useless for these particular samples, as most of the fines go through the perforated plate and so are ineffective in influencing the readings. The drainage time is shown to be more sensitive than the Shopper-Riegler, because less stock is lost and by the same reasoning, the drainage factor (see TAPPI Standard T 205 m-36) should be still more reliable, as the method compensates for the loss of fines.

Incidentally the above figures constitute a caution to optimists who believe that it is possible to construct correlating curves applying to all pulps, using various freeness testing instruments. The retention of the fine material is different with different kinds of instruments and consequently, no one set of curves can be held to be even approximately correct for all stocks.

Physical Tests of Pulps

The physical properties of pulp which are of major importance in its evaluation are as follows: The specific volume, proportional to the bulking quality; the burst factor or alternatively the breaking length, proportional to the burst and tensile strength respectively of a hand sheet of constant basis weight; the tear factor which is proportional to the force necessary to tear a sheet of a constant basis weight; the folding test (on a sheet of standard basis weight); the drainage time, the number of seconds which the sheets take to form, and lastly, but not least, the microscopic characteristics of new and unknown fibers. The last should serve to weld the various factors together into a composite conception of the true characteristics of the pulp being examined.

In Table VI are given the beating characteristics of various pulps, which illustrate the following additional particulars concerning these tests.

SPECIFIC VOLUME

This test, which must be regarded as pivotal and most important, has received scant notice in the literature. Except for some passing interest when it was discussed by R. H. Doughty a couple of years ago under a new name, "solid fraction"; the density or apparent specific gravity, or its reciprocal, bulk or specific volume, has scarcely been mentioned, and it almost certainly has not received the attention which it deserves. This is all the more surprising when it is one of the quickest and easiest of tests to make and, as it happens, one of the most reproducible and reliable.

In the U. S. A., Canada, and Great Britain, the new accepted standard for expressing the test, is in the form of bulk or specific volume, which is defined as the volume, in cubic centimeters, occupied by one gram of paper. As cellulose itself has a specific volume of about 0.64, if it were possible to make a paper having this low value, it would have no air spaces whatever between the fibers nor even in the fibers themselves. In order to visualize the significance of the test, it may be assumed that any paper having a specific volume of 1.00 (i.e., that of water) has its fibers as solidly compacted together as is practicable, like glassine for example. Consequently, a paper having a bulk of say 2.0, would contain about as much air space

TABLE VI.—BEATING CHARACTERISTICS AND TESTS OF VARIOUS PULPS

	Specific Volume [1]						Burst Factor [2]						Breaking Length [3]						Tear Factor [4]						Drainage [5]	Opacity [6]
Revolutions per gram.....	U	2	4	8	16	32	U	2	4	8	16	32	U	2	4	8	16	32	U	2	4	8	16	32	at	%
No. 1 rag muslin.....	2.25	2.2	2.1	2.05	1.9	1.8	19.5	20.0	20.2	21.1	20.1	19.2	2090	2200	2350	2510	2790	2800	316	320	300	285	265	215	32	..
Bleached sulphite	1.7	1.6	1.5	1.4	1.3	1.2	24.3	27.5	30.1	28.6	28.0	27.5	3660	4050	5150	5470	5600	6050	135	110	95	80	65	55	15.3	78
Unbleached sulphite	1.65	1.55	1.5	1.4	1.35	1.3	28.7	33.1	39.9	43.9	46.4	46.8	4570	5500	6450	7220	7930	8030	175	155	135	120	100	85	7.3	79
High bleached sulphate.....	1.75	1.65	1.55	1.45	1.35	1.30	20.4	18.0	16.3	14.0	13.0	12.0	3860	3900	3900	3540	3600	3500	55	45	40	30	25	20	30.0	79
Bleached sulphate (Stora 32)	1.95	1.9	1.8	1.7	1.6	1.45	26.0	34.1	42.0	48.5	52.3	51.5	3500	4300	5430	6350	7280	7810	270	295	290	270	185	105	5.0	..
Swedish unbleached kraft...	2.0	1.9	1.85	1.75	1.6	1.5	20.4	30.0	35.2	44.5	52.6	58.0	3400	4200	4800	5600	6800	7500	240	225	200	180	160	135	5.2	94
Poplar bleached soda.....	1.75	1.65	1.55	1.45	1.35	1.3	15.8	15.6	15.9	15.2	15.1	13.2	3640	3760	3920	3780	3880	3770	50	45	40	35	30	25	11.5	82
Chestnut bleached soda.....	1.8	1.7	1.6	1.55	1.45	1.4	17.7	15.3	14.2	12.9	10.9	10.5	3660	3560	3400	3430	3180	3000	55	45	40	30	25	20	15.0	84
Bleached straw	1.5	1.4	1.35	1.3	1.25	1.2	29.2	30.8	32.0	35.5	35.8	37.7	5330	5970	6220	6700	6900	7330	50	50	47	45	40	35	28.5	75
Bleached esparto	2.4	2.3	2.2	2.1	2.0	1.85	15.6	17.2	17.5	19.1	20.7	23.7	3160	3460	3570	3690	3850	4170	70	85	85	87	70	65	7.5	84
Medium groundwood	2.4	2.3	2.25	2.15	2.05	1.9	13.4	13.8	14.0	13.5	12.5	11.9	2760	2850	2960	2900	2820	2850	41	40	37	33	28	25	36.0	93
Drainage time of groundwood							22	23	23	25	28	36														

Beaten at various revolutions per gram with the Clark Kollergang.
Sheets made and tested according to TAPPI Method T205M.

[1] Specific volume: $\frac{1}{\text{Density}}$ (Water = 1).

[2] Burst factor: Grams per square centimeter bursting pressure divided by substance in grams per square meter.

[3] Breaking length: In meters.

[4] Tear factor: Grams to tear a single sheet divided by substance in grams per square meter.

[5] Drainage time: Time in seconds required for the well beaten test sheets to form.

[6] Opacity: Percentage contrast ratio (method approximately TAPPI Standard).

between the fibers, as the minimum space which in practice it is possible to have the fibers themselves occupy. As pulp is progressively beaten, the specific volume of the resulting sheets tends towards unity, near which point transparency, hardness and brittleness become evident.

The great value of this test is its invaluable application as modifying factor to the other tests as will be explained later.

Burst Factor and Breaking Length

In general these two properties go together, both measuring the cohesiveness of the structure of the sheet, because the fracture in a bursting test, is really the indirect result of its tensile failure. Upon consideration of the mechanics of the test, it is clear that of two papers of equal tensile strength but possessing different degrees of stretch, the one with the least stretch will burst the soonest. This is because the least stretchy paper will bulge less under a given pressure and the tensile stress induced in it accordingly will be much greater. This, of course, is the reason for rounding or dishing the ends of pressure vessels. In fact, by examining the relationship between the burst factor and breaking lengths of two pulps, the degree of stretchiness of the two pulps may be inferred. A measurement of stretch is a valuable quality index, indicating toughness, and the determination of both the breaking length and the stretch of the test sheets, while somewhat more troublesome to carry out as compared with making a bursting test, gives a much better understanding of quality. It is believed that the stretch test would give quite as good, if not better, indication of the ability of papers to withstand ageing than the folding test which commonly has been used for that purpose.

Upon examining the specific volume figures in Table VI, it is obvious that any test showing both a high specific volume and high burst factor or breaking length, indicates a long fibered, good tough pulp with high folding and tearing properties, whereas the results for any other pulp with a similarly high burst factor, but lower specific volume, indicates a relatively poorer quality pulp usually made up of shorter and denser material. This usually results in a more brittle sheet having lower fold and tear.

Tear Factor

As has just been indicated, this may be appraised by a consideration of the ratio of the breaking length and burst factor to specific volume. In general, the tear factor may be said to give a measure of fiber length, plus the cohesiveness of the stock. That the cohesiveness of the stock is also a factor, may be seen by the effect of the addition of white water to the pulps in Tables I and IV, which increased the tear factor, even though the average fiber length must have been shortened; also by the rise of the tear during the initial stages of beating of certain pulps in Table VI, especially those which initially are very free and devoid of cohesive material.

In mill beaters, the tear of the stock invariably rises for almost all pulps during the preliminary stages of beating; whereas in miniature equipment, the tear usually falls. This is explained by the fact that in the laboratory, because of the much more uniform treatment of the pulp, increase of cohesiveness and decrease of average fiber length proceed much more uniformly together than in the mill beater. In a large beater tub with heavy tackle, relatively only a very small percentage of the total fibers are treated in the initial stages, and these are so smashed that they primarily form cementing material which serves to increase the tear, until the general reduction of average fiber length begins to reduce it.

Folding Test

Unfortunately, the folding tests for the pulps listed are not available, but those familiar with their folding properties, may observe a distinct correlation between the tear factor modified by the specific volume, and their folding quality. A test sheet that it not too bulky, that is having a moderately low specific volume, together with a high tear, indicates a tough pulp which will withstand many folds. Such a sheet, in general, will also have a high degree of stretch.

Drainage Time

This bears a relationship to both the fineness of the fiber and the presence of fibrillae and fine particles. If the specific volume is considered in relation to the drainage time, it is quite possible to get a good indication of the amount of very fine material present in the pulp.

Miscellaneous Factors

Additional factors, such as absorbency, porosity, opacity, pliability, stiffness, rattle, printing qualities and surface smoothness may be judged with more or less accuracy from a consideration of the factors stated, more especially in conjunction with the specific volume of the sheets.

A microscopic examination of the pulp, to determine the average length and thickness and the thickness of the walls of the fibers, is a great help. Indeed it is possible for an expert microscopist who in addition takes cognizance of the nature of the fiber surfaces, to obtain almost as much information from samples of pulp beaten to various degrees, as with the tests discussed. He has one very big advantage over those performing physical tests on unknown samples of pulp in that he does not lose sight of the most important constituent, the very finest particles. If these are not adequately considered, the testing of pulp is not a science, nor can it ever become an art.

Acknowledgment

The writer wishes to thank S. P. Moore of the Scott Paper Company, who performed the experimental work for all data included in this paper.

Development and Refinement in Design Of Paper Machines*

By G. A. Peterson[1]

Since 1804 when the Fourdrinier brothers acquired existing patents on fourdriniers, the development of paper machines moved forward slowly at first, and then gathered momentum in the 1890's, when machines started to get wider and faster running. When wire widths were increased and the higher speeds contemplated, the design of paper machines changed from rule of thumb to more scientific methods of manufacture, requiring the services of high grade engineers, and the most modern manufacturing equipment, both in the machine shop and foundry.

New ideas were incorporated in machine designs, many by paper makers, as well as by engineers employed by machine builders; and by cooperation between them. The machine builders have had to step right along to keep abreast with new ideas and to incorporate them in their new designs.

Flow Box and Slice

Until 1923 the standard type of flow box was used, and on the faster running machines the wire sloped in a downward direction as much as 36 inches, to give artificial head to the stock. The high pressure stock inlet changed this, and with this piece of equipment the stock was given a velocity nearly equal to the speed of the wire. With increasing speeds deckle straps were discarded, as it was found that stock did not have time to flow over sides of wire. Slices over the wire have taken new form, the latest design being one having a flexible lip, so that adjustments can be made entirely across the sheet to level it by the use of adjusting screws spaced at close intervals.

Rolls and Suction Boxes

Table rolls are now nearly always mounted in antifriction bearings and dynamically balanced, which gives smooth running rolls, without whip. Rubber covered rolls are becoming more and more popular. Fabricated from steel pipe and covered, they are considerably stronger than the brass tube, and will run at the higher speeds with little or no vibration, if balanced properly.

Considerable difficulty has been experienced in obtaining suction box covers that would stand up, especially on the wide machines. Rotary boxes have not been uniformly successful, and various synthetic materials for covers have met with varying success. We have found that a maple cover, with the end grain of the wood in contact with the wire, and impregnated with tallow, makes an excellent cover. The wood is cut into segments about 3 inches wide, and drilled in any way desired. The segments are held in place by extruded metal strips at the sides of cover, and these strips are held in place by screws fastened to top of suction box. Oscillators, causing the boxes to move crosswise or lengthwise of the wire are a help in keeping the covers from corrugating, and thereby increasing wire life.

Dandy Rolls, Suction Rolls and Shake

Dandy rolls of the open end type are coming into general use. One type of roll has a ring on each end, which is supported by trunnion bearings, leaving both ends open and in which steam or shower pipes may be readily placed. Another type has a ring on each end, and has three flanged pulleys inside of ring which supports the roll. Water and steam showers may be inserted in this roll at the stationary support at center of roll. Both of these types of dandies are in successful operation.

Improvements have been made in seams on dandy rolls and fourdrinier wires. The most recent development is the welded seam, which is now in successful use, the seam being so perfect it is difficult to observe where wire is joined together.

Suction couch rolls are, of course, an old story, but these rolls have been so improved in design that very little trouble is experienced in keeping them in continuous operation. The cantilever type of roll is a great help in changing wires, and spring support of deckles creates uniform pressure against inside of roll, giving long life to deckles and preventing air leaks. Journals are mounted in roller bearings, keeping the roll in line with the machine. Vacuum pumps have been improved, and, with piping designed for use of natural forces, considerable power is saved.

Rolls having covers of soft rubber are mounted on top of couch rolls, which help to make machine run safer.

There are a great many shake heads of improved design available. The most interesting design is the one having a true Scotch motion, totally inclosed and running in oil, and so designed that length and number of strokes may be changed while running. This shake gives a perfect motion, both in a forward and in a reverse direction, and to a great extent does away with heavy and light edges, if stock is flowed onto the wire properly.

The Press Section

Suction rolls are being used more and more in the press sections of paper machines. A great many of them are rubber covered. Some little trouble has been experienced in keeping them clean, but this difficulty has been overcome by taking the proper care of them.

Granite rolls are gradually being replaced by the use of rubber rolls, in which particles of granite are embedded in the rubber matrix.

Antifriction bearings on all rolls of the press are now in commercial use.

The newer type of press roll doctor is fabricated from built-up wrought sections, and is much lighter than the cast iron doctor. This built-up doctor is so designed that it exerts far less pressure on the press roll and has a thin apron of some non-corrosive metal so that the stock does not come in contact with any metal that would rust. The doctor blades are of thin bronze or of some form of thin micarta. Most doctors are designed to oscillate back and forth across the roll.

To conserve the space which the press section now takes, two recent developments have taken place. A three roll press having the rolls on a horizontal center line, takes the place of two regular presses. This type of press may have two suction rolls and one solid roll between them,

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 22-25, 1937.

[1] Engineer, Rice Barton and Fales, Worcester, Mass.

or one suction roll, one rubber covered roll and one brass covered roll. The two outside rolls are mounted on swinging arms and are brought into contact with the center roll by tightening nuts mounted on screws and having a heavy spring under the nut. The intake shafts have knuckle joints to take up movement of the swinging rolls. One of the rolls is driven by a quarter turn unit and the other roll is driven through cone pulleys mounted on intake shafts of each roll.

The other development to save space is to have one upright housing having a heavy pin on which the swinging arms for both presses are mounted. This type of press has the swing arms for top rolls offset so that the bearings for the rolls are in line, and consequently the upper rolls are mounted directly above the bottom rolls or slightly couched. This press may be hooked up the same as the regular type, the paper may be run straight through or reversed as desired. The drives are the same as on present press sections. On both types of press the felt runs into the basement and they both take about the same amount of space. On old machines where presses of this type have been installed, as many as six or eight additional driers have been installed in the space saved by the press.

Top press roll drives of both the mechanical and electrical type have been used quite considerably. The electrical type of drive can be regulated very easily to place just exactly the right amount of power in the top roll driving it at exactly the same surface speed as the bottom roll. The electric type of drive has been used to great advantage for driving individual units on the wet end of the cylinder machine. By driving the individual units by motors, all of the strain for driving them is taken off the felt, and in some cases this has shown up in a wider sheet of paper at the reel, less crushing of the sheet in the presses, and better formation of the sheet, due to less shrink and stretch of the felt going through the presses.

The Drier Section

On machines making pulp, the tendency has been to use larger and heavier press rolls, some of these rolls being 42 inches in diameter and exerting a line pressure of 900 pounds per inch of face of roll. For exerting this pressure on the rolls, a piston and cylinder are used in which either air or water may be used, the piston being fastened to top roll arm through a rod. Using these heavy rolls and pressures, the sheet goes into the drier section much drier than when the smaller press rolls were used.

Drier sections have been refined further by using antifriction bearings on all rolls, as well as on the driers themselves, and all of these rolls being placed in running balance, to reduce vibration. The metals now used for molding the drier shells are alloyed with extreme care, giving a close and dense surface, which is a great advantage, especially on creping driers. The driers are bored on the inside and turned and ground on the outside, and all casting strains are relieved, which prevents the driers from becoming egg shaped.

Small drier gears with idler pinions are used, totally inclosed by guards, running in oil and continuously lubricated. Using the smaller diameter gears and totally inclosing them gives greater space for allowing steam vapors to escape as well as keeping the driving side of the machine as clean as the tending side.

Air systems of one kind and another are used for heating up the paper as well as helping to blow the steam vapors out from between the driers. Exhaust systems are used for carrying away vapors and using vapors to heat incoming air.

Many different types of drainage systems are used for expelling condensate and non-condensable gases from the driers. One of the simplest systems now in operation makes use of an ejector at the end of the siphon pipe inside of the drier. This ejector has a small orifice in it which automatically sets up a differential in pressure between the inside of the drier and the condensate header which causes the water and air to flow out of the drier uniformly. It also holds the steam in the drier, and it condenses there, giving up the maximum of heat units through the drier. Control valves are used for allowing the proper amount of steam to flow to the drier section to keep it at the proper temperature and to dry the paper with the right amount of moisture in the sheet.

Calenders, Reels and Winders

Calenders are much the same except that possibly they are heavier and more ruggedly built than when machines operated at the slower speeds. The rolls have been improved by alloying metals more scientifically and with greater care. The tendency on new calenders is to mount the rolls in roller bearings to make them run more smoothly and to keep the rolls in line permanently. Improved machines have been developed for grinding the rolls more accurately.

The Pope type of reel is coming into more common use, especially on the slower running machines and on heavy papers, reducing waste of paper at this point as well as making excellent rolls.

Unwinders are much the same, but improvements have been made for keeping proper tension in sheet between the unwinder and winder. For a brake, an electric generator is used, and the current generated is used for driving the winder. The winders are built heavier to run at higher speeds and all rolls are dynamically balanced to prevent vibration. Balancing of rolls and drums is very necessary to get good paper rolls, especially at the higher speeds.

Machine Drives

Both the electric and mechanical drives have been refined in design and simplified. On the very large and high speed machines, the electric drive is still popular, but on machines running up to 1000 feet per minute the spiral bevel and hypoid types of drive are more numerous. The hypoid type is becoming more popular as its advantages are being brought to the attention of the operators. This type of drive takes up less space which in many cases is of prime importance, the vertical distance from floor to intake shaft is shorter than on any other type of mechanical drive, the drive may be operated at high speeds with little or no vibration, it is totally inclosed and running in oil, and both the gear and pinion shaft have two bearings each mounted in the self-contained casing.

Magnetic clutches are being used more and more due to the fact that they are in better balance which allows them to run at higher speeds than the mechanical clutch. No lubrication is required and therefore they are much cleaner. They require less space. They can transmit greater power, as well as being able to pick up heavy loads easily and smoothly. They require very little maintenance to keep them in continuous operation.

Many parts on the paper machine other than those mentioned have been developed in recent years, but they are too numerous to mention in a paper of this kind.

It is the writer's opinion that progress in refinement and design will go forward very fast in the next few years, and it behooves all progressive operators to keep up with these developments in order to keep his mill on a prosperous and efficient basis.

Influence of the Solid on the Flow Properties of Dilute Suspensions*

By R. N. Traxler[1]

Abstract

The flow properties of dilute suspensions of clay and other minerals are of interest to the pulp and paper technologist. A discussion is given of the various types of flow encountered in dispersed systems containing various concentrations of solid. The instruments available for evaluating flow properties in such systems are mentioned.

It is pointed out that particle size, size distribution, and shape are primary properties of the particles of a mineral filler, and that dependent on these are the secondary properties of the compacted powder such as percent voids and average void size. The methods for determining both primary and secondary properties are briefly discussed.

A simple relationship has been established between volume concentration of the solid present and the viscosity of the suspension. This relationship makes possible an accurate evaluation of the influence of a dispersed solid on the flow properties of slurries of which it is a part.

Since the finely ground minerals used in filling and coating paper are handled and applied in the form of dilute suspensions in water, the flow properties of such slurries are of interest to the pulp and paper technologist. It would also be advantageous for him to know what properties of the dispersed, pulverulent solid influence its effectiveness as a filler or coating, and how these affect the viscosities of the slurries handled in the paper mill. Many other industries have sought answers to similar or related questions. The paper technologist may borrow with profit from the discoveries and experiences of the paint chemist, well-drilling expert, road builder, ceramist, and others in apparently unrelated fields.

Determination of the Flow Characteristics of Dilute Suspensions

In recent years a vast amount of work has been done in developing new methods of viscometry and in expanding the applications of older methods. A book[1] recently published in English by the Academy of Sciences at Amsterdam could be read with profit by anyone interested in rheology and viscometry.

From the results obtained using many different materials and various dispersed systems, several types of flow are now recognized. These types are most readily distinguished by the nature of the curve obtained by a plot of rate of shear versus shearing stress. Fig. 1 illustrates three different kinds of rate of shear-shearing stress relationships which may be obtained with liquid-solid systems. In Fig. 1A, which represents viscous flow, a plot of rate of shear versus shearing stress gives a straight line passing through the origin. The reciprocal slope of the straight line, which is constant over the entire range of shearing stress, evaluates the viscosity of the material (viscosity=shearing stress/rate of shear). Of course, the rate of shear must remain low enough to avoid turbulence. Many dilute suspensions of clay and other minerals are viscous liquids.

Fig. 1B shows the type of rate of shear-shearing stress curves obtained with systems which possess so-called non-Newtonian flow characteristics. Since for these materials plots of rate of sheer versus shearing stress give various curved lines passing through the origin, the "viscosity" calculated decreases with increased shearing stress. If a "viscosity" value is reported for such a material the shearing stress or rate of shear used must be reported also. When the solid particles are present in sufficient concentration to possess some degree of orientation, and thus impart structure to the dispersion, the system becomes non-Newtonian or "quasi-viscous." Such systems may frequently be encountered by the paper technologist.

Ideally, a plot of rate of shear versus shearing stress is, for plastic flow, a straight line which intersects the shearing stress axis at some point called the yield value. This type of flow is illustrated by Fig. 1C. Any shearing stress below the yield value will not deform the material permanently. The slope of the straight line obtained after the yield value is exceeded and flow occurs is a function of the mobility of the system. Recent investigations at low rates of shear have shown that instead of intersecting the

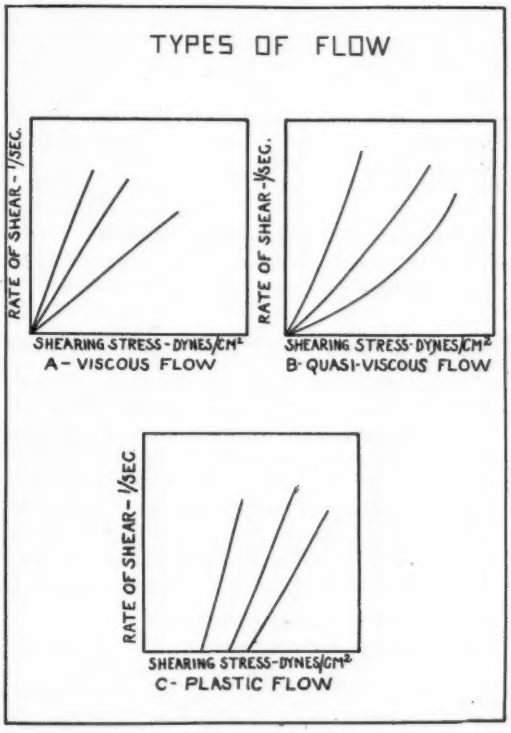
TYPES OF FLOW
RATE OF SHEAR - 1/SEC.
SHEARING STRESS - DYNES/CM²
A - VISCOUS FLOW
RATE OF SHEAR - 1/SEC.
SHEARING STRESS - DYNES/CM²
B - QUASI-VISCOUS FLOW
RATE OF SHEAR - 1/SEC
SHEARING STRESS - DYNES/CM²
C - PLASTIC FLOW

Fig. 1

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 22-25, 1937.

[1] The Barber Company, Inc., Maurer, N. J.

shearing stress axis, the curves frequently bend sharply and pass through the origin. In order to possess "plastic" properties a suspension must contain a sufficiently high concentration of solid particles to create some state of packing. Such systems will probably be encountered by the pulp and paper chemist only when the suspension becomes concentrated during the removal of the water from the sheet.

Recently Hobson *(2)* has reviewed a large number of studies concerning viscometric measurements on clay slurries, and his bibliography would be valuable to anyone interested in this subject. The capillary tube type and certain forms of the rotating concentric cylinder type of viscometer seem to have been most generally used in the study of clay suspensions. At low concentration of solids where the suspension is a viscous liquid, some kind of capillary tube viscometer may be useful. However, when the concentration of the solid is increased to the point where orientation of the particles occurs and non-Newtonian or plastic flow appears, a viscometer of the rotating cylinder or disc type should be more suitable because equilibrium values can be obtained over a wide range of rates of shear with such instruments. Usually the solids will settle quite rapidly in the slurries employed by the paper maker; consequently, he will have to use a viscometer so designed that the solid particles can be maintained in suspension during the viscosity determination. A modified falling ball viscometer *(3)* might be successfully used with these dilute dispersions.

Many arbitrary methods have been proposed for measuring the flow properties of different materials. Although some of these methods may have practical value and be suitable for use with purely viscous liquids, they cannot give reliable information concerning the flow in systems which are non-Newtonian or plastic. Further, it is very desirable that methods be employed by which the flow properties are evaluated in absolute units.

Liquid-solid systems of certain concentrations may become more fluid on stirring and thicken again when the agitation is stopped. Thixotropy is the name given to this reversible phenomenon. Gamble *(4)* has discussed thixotropy in oil paints and has shown that this property can be correlated with properties of such practical interest as pigment settling, brushability, and levelling. Although Gamble's work was done with oil paints, similar studies could be made with profit on the water suspensions used in filling, coating and coloring paper and card board. Correlation of the results obtained from such a study with the properties of importance in mill operation should be very useful.

Properties of Solid Particles and Compacted Powders

The solid particles used in filling or coating paper possess four primary physical properties which influence their value and efficiency for such uses. These properties are particle shape, surface texture, size and size distribution. Surface area per unit weight or volume may also be considered a primary property although it is dependent on the four properties just mentioned. The void content and average void size of the compacted powder are secondary properties governed mainly by the primary properties.

Particle Size and Size Distribution

Average particle size and particle size distribution may be determined or estimated by a number of different methods. Work *(5)* has written an excellent review of the subject in which he classifies the methods used in size analysis as follows:

Direct measurement

1. Sieving
2. Elutriation or sedimentation
3. Microscopic measurement.

Indirect comparisons

1. Settling rate in a fluid medium
2. Apparent density or packing volume
3. Hiding or light-dispersing power
4. Rate of solution
5. X-ray dispersion
6. Plasticity
7. Effects in products, such as rubber, putty, etc.

Direct microscopic measurement probably is the most reliable method but it is fatiguing and time-consuming for powders possessing a wide range of particle sizes unless the examination is preceded by fractionation of the whole powder. For this purpose Roller *(6, 7)* designed an air elutriator or analyzer by means of which mineral powders can be separated into very close size fractions. For powders passing a 200-mesh sieve it is common practice to separate into five fractions (-5, 5-10, 10-20, 20-40 and 40-80 microns). A micron is 1/10,000 centimeter. The following list gives the dimensions in microns of the openings in a number of the United States standard sieves.

Sieve No.	Size of Opening (in microns)
100	149
140	105
200	74
230	62
270	53
325	44
400	37

The particles in the fractions of close size limits obtained with the air analyzer can be counted and measured more rapidly and with greater accuracy than can the unfractionated powder. Projection of the image of the particle upon a screen should be used in counting and measuring the small particles ranging from 0.25 to 10 microns in diameter.

Odén *(8)* developed a sedimentation method for determining particle size distribution and applied his technic to the study of soils and clays. The Bouyoucos hydrometer *(9)* which has been widely used in making mechanical analyses of soils and clays could be, and probably is used in paper mills for estimating roughly but quickly the particle size and size distribution of the minerals used for filling and coating.

A turbidimeter for determining the particle size distribution in pulverulent solids has been designed by Wagner *(10)*. This apparatus utilizes a combination of Stokes' law of fall of solid particles through a viscous medium and the law relating the turbidity of a suspension to the surface area of the suspended solid. The apparatus and technic, originally devised to measure the particle size distribution in portland cement, has been modified by Traxler and Baum *(11)* for use with other pulverized minerals. The method should be very useful in paper mill control work on solids if the average particle size is not too small.

For very fine powders the centrifuge offers a means of obtaining a size analysis. Very recently Hauser and Reed *(12)* have employed the centrifuge to determine distribution curves. Marshall *(13)* has used this instrument for the mechanical analysis of clay dispersions.

The technologist interested in the evaluation of particle size and size distribution and their relation to surface area should refer to the publications of Perrott and Kinney *(14)*, Green *(15)* and Hatch *(16)* who give complete dis-

cussions concerning the treatment of size and size distribution data.

Particle Shape and Surface Texture

Shape and surface texture of the solid particles probably have a marked influence on the value of a mineral for use in paper manufacture. Upon these properties will depend to a certain extent the retention of the filler or coating by the paper; the physical properties of the finished product will also be affected. Most clay particles are plate-like in shape but the ratio between the three axes (which defines shape) may vary greatly with the kind of clay and the degree of dispersion. Marshall *(13)* in discussing clays observed "that below 500 millimicrons the particles were not so markedly plate-shaped as those in the range 500 millimicrons to 2 microns."

A simple method for evaluating the shapes of solid particles might be useful in correlating this fundamental property with the practical physical characteristics created in the finished paper. The surface texture of the particles, although having an important bearing in many applications, will be very difficult to evaluate quantitatively.

Surface Area

As mentioned previously, surface area per unit weight of volume is governed by particle size, size distribution, shape and surface texture. Various methods are available for estimating surface area all of which, however, are approximations. In cases where the law relating to the surface area of the suspended material to the turbidity of the suspension is valid, the turbidimeter is a very useful instrument. Direct count and measurement of the particles followed by calculation of the harmonic mean diameter *(6)* make possible the estimation of surface area even when working with plate-like or acicular particles. Heywood *(17)* has written an excellent dissertation on the calculation of specific surface. His paper and the accompanying discussions are very helpful in obtaining a clear understanding of this subject.

Void Content of Compacted Powders

The per cent voids in a compacted powder is useful in evaluating the influence of the powder on the flow properties of a mixture of which it is a part; in general the higher the void content, the more effective the mineral. Bulk density determined by dry compaction of the powder is frequently used for the calculation of per cent voids. The dry powder is placed in a glass graduate which is then tapped by hand, preferably on a brick covered with a section of auto inner tube, until no further compaction occurs. From the volume and weight of the powder its "bulk density" is calculated. Knowing the density of the mineral the per cent voids may be calculated from the equation

$$V = 100 - \frac{B}{p} 100 \qquad (1)$$

where V = per cent voids in the compacted powder
B = bulk density of the powder in grams/cc.
p = density of the mineral in grams/cc.

Norton and Hodgdon *(18)* studied the porosity and particle spacing for a number of clays and other minerals under various conditions. Several methods for determining per cent of voids in compacted mineral powders were described by Traxler, Baum and Pittman *(19)* who also discussed the influence of particle size, size distribution, shape and surface texture on void content. Roller *(20)* studied the bulking properties of very fine powders.

Although void content is very useful in evaluating certain fillers it is likely to be unreliable when applied to clays and other very finely divided solids whose particles are non-uniform in shape. Since these types of filler are used in paper manufacture, the more reliable evaluation described below is recommended.

Average Void Size in Compacted Powders

The average void size can be calculated from the permeability of a compacted, unconsolidated powder. An apparatus for measuring the rate of diffusion of air through a column of compacted powder has been described *(21)* and the equations given for calculating the permeability and average void diameter. Further, an empirical relationship has been found to exist between the per cent voids and average void diameter, which may be expressed as

$$\log d = m B + b \qquad (2)$$

where d = average void diameter in cm.
B = per cent voids.
and m and b are constants.

This equation with a value of 0.019 for the slope "m" has been found to hold for a large number of commercial mineral powders. Having determined experimentally the average void size for some easily obtained void content, "b" can be calculated. Then, it is possible by means of Eq. (2) to calculate, within certain limits, the average void size for any per cent voids.

For certain minerals, such as clay, mica, celite and asbestos, all of which possess particles whose three axes are very non-uniform in length, Eq. (2) may not apply. However, for such materials the relationship between per cent voids and average void diameter may be established experimentally. Values may then be interpolated from a plot of per cent voids against the logarithm of void diameter.

In the laboratories of The Barber Company, Inc. many different powders have been mixed with asphaltic liquids to give viscous mixtures, and the viscosity of each mixture determined in absolute units (poises) at 25 deg. C. The volume per cent of liquid present in the mixture was assumed to be equal to the per cent voids in the dispersed solid. Then using this void content the average void size of the powder as present in each mixture was calculated using Eq. (2) or was picked from an experimentally determined per cent voids-void diameter curve. From the data obtained on these mixtures it was found *(22)* that the viscosity of a liquid-solid system (where no chemical reaction occurs between the liquid and solid) is *inversely proportional* to the average void size of the powder as dispersed in the mixture.

TABLE I.—RELATIONSHIP BETWEEN VISCOSITY AND AVERAGE VOID SIZE

Mineral powder	Volume per cent mineral present	A Viscosity of asphaltic mixture at 25 deg. C. (poises)	B Diameter of average void in powder as present in mixture (microns)	A × B
Red Slate	10	8.92×10^8	15.0	134×10^8
5-10 microns	20	13.4×10^8	9.70	130×10^8
	25	16.4×10^8	7.79	127×10^8
	30	20.0×10^8	6.26	126×10^8
Red Slate	10	8.83×10^8	47.1	416×10^8
20-40 microns	20	13.7×10^8	30.4	416×10^8
	25	17.1×10^8	24.5	418×10^8
	30	21.2×10^8	19.7	418×10^8
Loess	5	4.11×10^8	16.8	69.0×10^8
	10	5.19×10^8	13.5	70.1×10^8
	20	8.28×10^8	8.73	72.3×10^8
	30	13.2×10^8	5.64	74.5×10^8
Talc	20	12.5×10^8	4.70	58.8×10^8
	25	17.4×10^8	3.17	55.2×10^8
	30	24.7×10^8	2.22	54.9×10^8
	35	35.0×10^8	1.65	57.8×10^8

Table I gives data for several combinations of liquid (asphalt) and different mineral powders. It is evident that the average size of the liquid films and masses (identical with the average void size of the powder as present

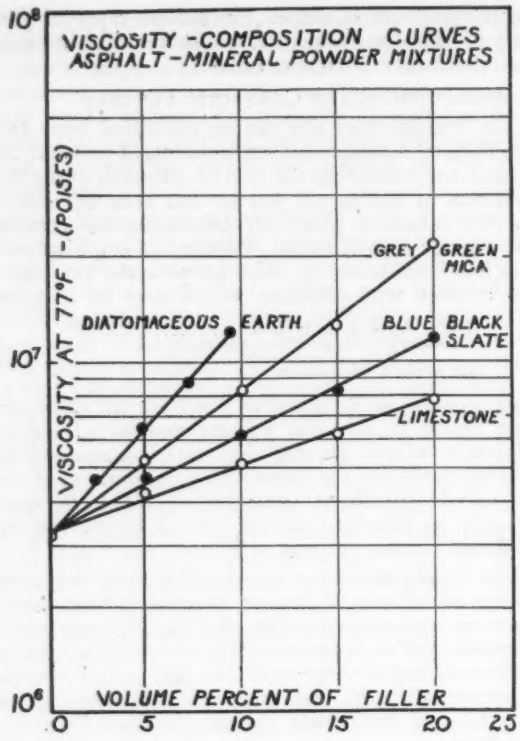

Fig. 2

in the mixture) separating the solid particles is the factor governing the viscosity of a liquid-solid dispersion.

When the dispersions are more concentrated and the particles are in contact, the friction between them complicates the type of flow. The system has then become non-Newtonian (quasi-viscous) or plastic and the above relationship between viscosity and void size is no longer valid.

In the effect of the average void size on the viscosity of a mixture we see the result of the combined influences of particle size, size distribution and shape since these are the properties governing the average void size (the average liquid film or mass) for any volume concentration of solid in a dispersion. The combined effects of all of the primary variables are measured by this secondary property of the powder.

Evaluation of the Influence of the Dispersed Solid on the Viscosities of Liquid-Solid Systems

Since the viscosity of a liquid-solid system appears to be inversely proportional to the average void size of the pulverulent solid as present in the mixture, it follows logically that as the concentration of the solid is increased (the average void size becomes smaller as the particles are brought closer together) the viscosity will increase. This has been found to be true for a number of liquid-solid systems *(22)*. A linear relationship exists between the logarithms of the absolute viscosities of viscous mixtures made from a given liquid and a particular powder and the volume per cent of solid present, or

$$\text{viscosity (poises)} = C\,10^{AF} \quad \ldots\ldots\ldots\ldots (3)$$

where F = volume per cent of solid and A and C are constants.

Fig. 2 which is taken from the paper mentioned above *(22)* shows how well Eq. (3) applies for different mineral powders. These minerals and the others studied are of interest to the bituminous technologist but those useful to the paper manufacturer should behave similarly.

The slope A of Eq. (3) offers a simple method of evaluating the ability of a solid to increase the resistance of a liquid to flow. A stability index has been proposed *(22)* which expresses the per cent change in viscosity for a one per cent increase in the volume of the solid present in the suspension. This quantitative index may be expressed as

$$\text{Stability Index} = 100\,(10^{A} - 1) \quad \ldots\ldots\ldots\ldots (4)$$
$$= 100\,(\text{anti-logarithm } A - 1) \quad \ldots\ldots\ldots\ldots (5)$$

where A is the slope of the log-viscosity versus volume composition curve.

Table II gives the stability indices for several powders including those shown in Fig. 2. Certain of the physical properties of these powders which influence the stability index have been evaluated also and are recorded in Table II.

TABLE II.—STABILITY INDICES AND PHYSICAL PROPERTIES OF VARIOUS POWDERS

Mineral Powder	Stability index (eq. 4)	Surface mean diameter (microns)	Specific surface ($cm.^2/g.$)	Per cent voids by dry compaction	Particle shape
Limestone	4.5	6.2	3,430	38.0	Granular
Clay	6.6	3.1	7,300	69.4	Plate-like
Black slate	6.6	4.1	5,120	57.6	Granular and acicular
Green mica	9.8	9.2	2,250	68.9	Plate-like
Diatomaceous earth	15.0	7.5	3,670	81.1	Very irregular

The stability index accounts for the combined effects of particle size, size distribution, shape and the degree to which the solid is dispersed.

This last variable is very important and it may be safely predicted that the accurate control of the degree of dispersion will be of great service to the paper manufacturer.

Acknowledgment

The author is indebted to C. E. Coombs, C. U. Pittman and H. E. Schweyer for valuable suggestions and criticisms.

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Maintenance With the Metallizing Process*

By R. A. Axline[1]

A brief description of the metallizing process and equipment, with particular emphasis placed on the developments of the last few years both in the field of new equipment, and improved operating technique. Of particular interest to the Paper Industry, is the summary of reports from the various mills using the process, listing specific applications and uses for metallizing, ranging from the repair of shafts, bearing surfaces, rolls pumps, etc., to the application of corrosion resisting coatings to pulp beaters, and other mill equipment. The metals used and service records are given where available.

Although the metallizing process was in use prior to the World War, it has only found widespread acceptance and use in the last five years. For this reason, it is not uncommon to find engineers who are either not familiar with the process, or if they are acquainted with it generally, have no understanding of the rapid advancements that have been made in its use, both practically and technically; nor do they have a clear picture of the practical, actual work which can be done with the process in their industry. It is likewise still usual to find a company using the process effectively in one plant, while another plant of the same company, having the same problems and uses will be totally unfamiliar with it.

This is, of course, a natural result of rapid development, and will, as naturally, be remedied as the process comes into wider use and understanding of its usefulness spreads.

For those who are not familiar with metallizing a brief description of the equipment and process is not amiss. A metal wire is automatically fed into the metallizer where it is melted by means of an oxyacetylene flame, atomized by an air blast and sprayed out in the form of finely divided molten metal particles. The metallizer "gun" is a small tool weighing from two and a half pounds for the small type, to five and one-half pounds for the large type. Three hoses lead into the "gun," one carrying acetylene at 15 pounds per square inch pressure, a second carrying oxygen at about 17 pounds per square inch pressure, and a third compressed air at from 60 to 80 pounds per square inch pressure. The oxygen and acetylene are mixed in the gun and burned in a cone of flame around the metal wire, melting it as it feeds through the gun. The compressed air is divided in the gun, part of it being used to drive a small, high speed air turbine, which with suitable gearing and feed rolls, automatically feeds the metal wire through the gun. The balance of the compressed air is used to atomize the metal after it has been melted. Hence, the metallizer gun is virtually a small portable foundry which melts and casts any metal continuously and automatically.

The metallizer will spray any metal which can be obtained in wire form, such as lead, tin, zinc, aluminum, bronzes, brasses, copper, carbon steels, stainless steels, nickel and nickel alloys, etc. These metals may be applied to any base material, i.e. they may be sprayed on wood, paper, cloth or any other metal. However, before the metal is applied, the base material, which is to receive it, must be suitably prepared. In the case of paper, wood, plaster or other naturally porous materials of that nature, the only requirement is that the base material be clean. In the case of other metals, the base material must be prepared either by sand blasting or grit blasting, or in the case of circular pieces, by rough turning in a lathe. This preparation of the surface before spraying is most important, since the bond between the base material and the sprayed metal is entirely mechanical, and this bond is almost entirely dependent upon the preparation of the base material before spraying.

For fifteen years prior to 1931, there was practically no change in either the equipment or the technique of metal spraying, and as a result its use was confined principally to a few specific uses, rather than, as is the case today, to the broad field of general maintenance in all types of industry. Since 1931, however, the progress in both the field of equipment and the field of technique has been very rapid, which progress has naturally led to a wide field of usefulness for the process.

In 1931 the average "gun" sprayed approximately one pound of stainless steel per hour, at a total deposited cost of approximately $2.54 a pound. Today modern metal spray equipment deposits approximately 6 pounds per hour at a a deposited cost per pound of $1.12. That is, during the last five years the spraying speed has been increased six-fold and the cost of spraying has been reduced 56 per cent.

To take another example, the average speed of zinc spraying in 1931 was 7 pounds per hour, and the cost per pound sprayed was approximately 49 cents. Today modern equipment can spray zinc at the rate of 25 pounds, nearly a four-fold increase at a cost of 26 cents per pound sprayed, or a decrease in cost of 47 per cent. These great increases in spraying speed and great reductions in operation costs have made the equipment available for work which, five years ago, would have been considered impossible.

The changes in the equipment itself have been no less striking. The equipment available five years ago was very unsteady in operation, required greasing every four hours of operation, required cleaning every eight hours of operation if the softer metals were used, and required such fine adjustments that a truly expert operator was necessary. The equipment was built more on the order of a fine watch, which continually required ad-

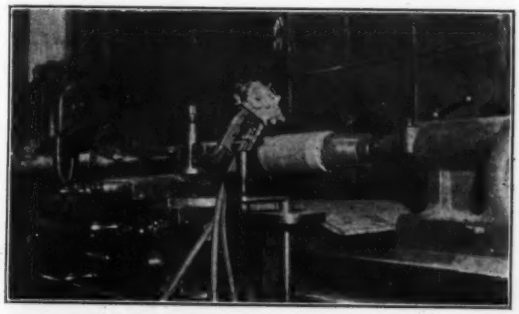

FIG. 1

Bearing surface which has been built up with 0.80 carbon steel. Note set up for handling mechanical parts in a lathe, with the "gun" mounted on the tool post. This shaft was prepared for metallizing by the new method of rough turning.

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 22-25, 1937.

[1] President, Metallizing Engineering Corporation, New York, N. Y.

justment in order to keep it operating properly. The wire used had to be of a particularly fine quality, free from kinks and other defects. Wire stoppages were a regular occurrence instead of the exception. In short the equipment could have been well compared to the early automobile, where the driver was compelled to clean the spark plugs twice and repair tire punctures five times in order to drive twenty miles.

Today a vastly different picture presents itself. The latest type of heavy duty equipment requires cleaning and greasing only once every two or three weeks. It is rugged and built as a production tool, instead of an experimental toy. The fine adjustments have been eliminated, and the average workman can master the operation in a short period of time. Commercial standard wires can be used and wire stoppages are a thing of the past. Like the modern automobile, the unit will give many "miles" of trouble-free, steady operation.

The engineer who was thoroughly familiar with the process and equipment five or even three years ago is now completely out of date, so far as metal spraying is concerned, if he has not kept abreast of these recent developments.

But with the exception of the advancement in equipment, the greatest steps have been made in the technical field, particularly in the correlating of data obtained from the laboratory and turning it to practical advantage. In the early days the metal spray process was advanced as a "cure-all" without due consideration having been given to the structure of the various metals after they were sprayed, the general porosity of all metal coatings, the low tensile strength of sprayed metal, etc.; also because the process is so versatile, because so many metals can be used for any given job, and because so little was actually known as to technique and procedure, many early attempts to use the process effectively ended in disaster. Oftentimes jobs failed, not because the process itself was at fault, but because there had been a wrong choice of either technique or material, or insufficient consideration had been given to the structure of sprayed metal itself. For example, as late as June 1935, engineers who were familiar with metal spraying were recommending that either of three metals, i.e. tin, zinc or aluminum was satisfactory as a corrosion resistant coating for cast iron beater tanks and hoods. When one of the pulp and paper companies wished to coat several beaters as a trial, all of the information then available was brought together and zinc was eliminated completely as being unsuitable. Either a tin coating or an aluminum coating seemed to have every chance of success. One beater was coated with tin and one beater with aluminum in March 1935. These beaters have now been in service twenty-one months, and the results have shown that tin has been entirely satisfactory for this condition to date, while the aluminum coating is definitely unsuitable and was breaking down badly within a few months after the application had been made.

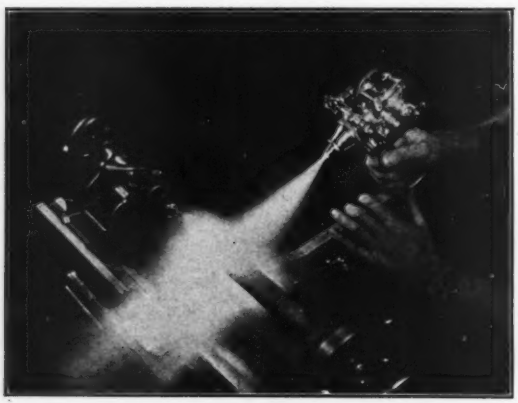

FIG. 2
The latest type of metal spray equipment in action building up a small shaft. Note rugged construction of this "gun."

In 1934 it was realized that the technical data available on metal spray were quite inadequate, and that practical data were practically non-existent. Although a vast fund of practical information was available because of the large amount of work which had been done during the two years previous, there had never been any concerted attempt to gather this data together, correlate it and bring it to a state of practical usefulness. This work has progressed satisfactorily during the last two years, and as a result practical information is available on metal spraying in almost every industry.

As late as 1932, the metallizing process was not considered suitable for building up bearing surfaces, pump plungers, and other mechanical parts where extreme wear, or heavy bearing pressures were encountered. Since that time improvements in technique have established this particular field as one of the most practical and most lucrative fields for metallizing work. It is now common practice to build up all kinds of mechanical parts, such as crank shaft bearings, pump shafts, pump plungers, rolls, bearing surfaces, etc. with any one of the various bronzes, brasses, stainless steels, or nickel alloys, according to the conditions involved.

In 1935, sprayed babbitt was practically unknown. The process of spraying babbitt in the box instead of casting it, as under the old procedure, has now firmly established itself with excellent results.

During the last few years a new method of the preparation of surfaces has also been developed, namely, that of rough turning instead of sand blasting, thus eliminating the necessity of sand blast equipment where shafts, pump plungers, and other circular mechanical parts are to be repaired. This method of preparation consists essentially of setting up the parts in a lathe and taking a rough cut across the piece with a V-point threading tool, cutting approximately 20 to 30 threads per inch. The tool is set slightly below center thus obtaining a tearing action and so roughening the base material. Such preparation gives an excellent base for sprayed metal and has led to a much more widespread use of the equipment for this particular type of work.

Use in Paper Mills

In paper mills, metallizing equipment is used primarily for maintenance work of two types, the first being that of restoring to service all types of worn or defective mechanical parts, ranging from the smallest pump shaft to the largest size rolls, and second, the application of corrosion resistant coatings to various types of equipment where corrosion has heretofore been a severe problem.

Various pulp and paper companies using the equipment have supplied concrete information on the work which they are doing, the results of which are given below. In each case the remarks given in quotation marks are the comments of the company using the equipment:

MECHANICAL PARTS

1. Triplex stock pumps. Many companies reported on these. Stainless steel is generally used for the repair. Oldest service record two years. "Satisfactory."

2. Paper carrying rolls. Many mills reported on these. Stainless steel used. Oldest service record one year eight months. "Pleased with results."

3. Wash pump casings, where leaks developed. These cracks filled in with 0.10 carbon steel. No service record. "*Does* prevent leakage."

4. Worn shafts of all kinds — worn journals, etc. Used .40 carbon steel and 0.80 carbon steel. Oldest service record 2 years 8 months. "Saved the shafts." "We have obtained good satisfaction from all these applications." "Numberless shafts have been built up and reused where formerly they were discarded. We are certain we have more than saved the cost of the two guns and miscellaneous equipment that was purchased for this work."

5. Babbitting drier bearing brasses. Applied 1/16" finished. Used babbitt wire. "Only one dryer bearing has failed so far; this melted out when bearing overheated."

6. Built up journals under ball races, sleeves or couplings. Used 0.10 carbon steel. No time given. "Satisfactory."

7. Built up stainless steel sleeve for acid pump. Used stainless steel. "Nine months in use with no sign of wear."

8. Built up c. i. bearing housing for filter, with 0.10 carbon steel. No service record. "Good satisfaction."

9. Built up c. i. draft tube at Deer Lake Power House with 0.80 carbon steel. "Good satisfaction."

10. Built up piston rods with bronze (stainless steel and 0.80 carbon steel also reported for this application.) "Satisfactory."

11. Paper machine drier. 36 inch diameter by 89 inch face. Built up with phosphor bronze. Service record six months. "Appears to be quite satisfactory."

12. Small steel rolls used to carry the sheet of pulp in a pulp drying machine. Sprayed with bronze. In service one to two months. "Appears to be satisfactory."

13. Rolls of all types (pipe rolls; felt rolls; etc., etc.) Oldest service 2 years, 6 months. Numerous service records two years. Used stainless steel, brass and bronze. "Very satisfactory." "Satisfactory to date." "No complaints."

14. Repairing cavitated turbine runners. Used various bronzes, 1.20 carbon steel and stainless steel. It has been definitely established that stainless steel is the most suitable metal. Service record 3 years. "Best method we have found."

CORROSION RESISTANCE

1. Saunders valves. Sprayed with lead and copper. Used to handle sulphite pump. "In service three years." "Present condition unknown."

2. Pipe fittings, valve tees, elbows, etc., sprayed with lead. Used to convey sulphite pulp. "In service one year." "Present condition not known."

3. Evaporator tubes. These tubes protrude 1" to 3" beyond header. The corrosion and abrasion of the black liquor which these tubes carry destroy the ends of the tubes where they protrude. These were brought up to size by spraying with stainless steel. "No service record."

4. Pulp beater shafts were exposed to mash. Used phosphor bronze and tin. Oldest service record 28 months (tin coating). "Tin coat very satisfactory."

5. Perforated plates and all covers in Bleach Plant. Used stainless steel. Oldest service one year. "Very satisfactory."

6. Covers and hoods. Copper, stainless steel and aluminum used. No service record. "Gave protection in places where paint would not stay on."

7. Construction of new large head tank. This tank was constructed of heavy copper plate. Difficulty was encountered in soldering the joints. Welding was then attempted with the result that the copper cracked and leaks developed around the rivets where the plates were put togther with butt straps. It was also necessary at the top of the tank to make a watertight joint between the copper and a wooden beam. No service record. "We were able by metallizing with copper to make the joints completely tight and the same by spraying around each rivet, and by spraying we were also able to make a completely tight weld between the wood and the copper."

It is hoped that this brief survey of the progress of the metallizing process will stimulate those who are not benefiting by its use to investigate the process, and that the job records given above will be helpful to those already using metallizing.

The Optical Characteristics of Paper*

III—The Opacifying Power of Fibers and Fillers

By F. A. Steele [1]

Abstract

In this article, it is shown how the previous adaptations of the Kubelka-Munk equations can be used to determine the individual contribution of the components of paper to its opacity. The relative opacifying powers of various fibers and fillers are presented.

In a previous article *(1)*, mathematical relationships were presented whereby useful calculations could be made concerning the opacity, reflectivity and basis weight of paper. With the continuously increasing interest in the behavior of paper fillers of all kinds, it appears worth while to extend this treatment from the gross optical behavior of paper to a consideration of the optical contribution of its various components. It is well known that various fibers and fillers differ greatly in their ability to contribute opacity to a sheet; it is now possible to place these relationships on a quantitative basis.

The Opacifying Power of Various Fibers

In Fig. 1 is reproduced a chart from the first paper of this series. From it can be read directly the value of SX from the value of the contrast ratio, $C_{.98}$, and the reflectivity, $R\infty$. As was described in the original article, S is the scattering coefficient of the paper and X the basis weight, (17 X 22-500, in the present discussion). Thus S can be determined directly for any sheet from a knowledge of its contrast ratio, basis weight, and reflectivity.

It should be borne clearly in mind that the value of S is a characteristic of the material composing the sheet, rather than of the sheet itself. Had the sheet been of a different basis weight, for example, the value of S would have been the same. Had more or less dye been added in making the sheet the reflectivity and the contrast ratio would have been different, but again the value of S

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 22-25, 1937.

[1] Chief, Paper Pigment Section, Research Division, The New Jersey Zinc Company, Palmerton, Pa.

would have been unchanged. It is conveniently termed the "S-value" of the material in question.

S-value is the direct measure of the effectiveness of a material in contributing opacity. Consider a sheet of unfilled paper which has a contrast ratio of 0.80 and a reflectivity of 0.84. From Fig. 1, the value of SX is found to be 3.00. If the basis weight is 20 pounds, S=3.00/20 =0.15. Had the sheet been made of a material having twice this S-value, the same opacity would have been obtained with a 10-pound sheet. The weight of sheet required to yield a given opacity at a fixed reflectivity is inversely proportional to the S-value.

Since the sheet under consideration contains no filler, the S-value so determined is the S-value of the fiber itself. The minor ingredients, size, dye, etc., have no appreciable effect. This S-value is partly a characteristic of the fiber as it was furnished to the beater and partly the result of the subsequent beating, calendering, etc. If sheets are made from various pulps treated in the same way, it is possible to compare their inherent opacifying powers. The results of such a study of a number of different materials are shown in the following table.

Fiber	S-Value
Bleached sulphite A	0.121
Bleached sulphite B	0.127
Bleached sulphite C	0.125
Bleached sulphite D	0.133
Bleached sulphite E	0.130
Bleached sulphite F	0.106
Bleached sulphite G	0.121
Bleached sulphite H	0.111
Unbleached sulphite A	0.086
Unbleached sulphite B	0.096
Unbleached sulphite C	0.095
Unbleached sulphite D	0.089
Unbleached sulphite E	0.111
Esparto pulp	0.161
Soda pulp	0.174
Alpha fiber	0.161
Soft Alpha fiber	0.186
Bleached kraft	0.186

In this way it would be a simple matter for a paper manufacturer to study the effect on opacity of the different papermaking operations and probably the pulping operations could be so studied with equal advantage. In the above data, it will be observed that the bleached fibers, in general, have higher S-values than the unbleached, but this is probably due to differences before bleaching, rather than to the bleaching operation, itself.

The Opacifying Power of Pigments and Fillers

In the case of filled paper, the scattering power is the additive effect of the fiber and the pigment, each exerting its effect in proportion to the amount present. If the S-value of one is known, the other can be calculated simply, as follows:

Let S be the scattering coefficient of the paper,
S_p the scattering coefficient of the pigment,
S_f the scattering coefficient of the fiber, and
y the fraction of pigment in the paper.

Then, $SX = y\,S_pX + (1-y)\,S_fX$

$y\,S_pX = SX - (1-y)\,S_fX$

$$S_p = \frac{S - (1-y)\,S_f}{y}$$

Since S is determined by dividing SX by the basis weight, S_p, the S-value of the pigment or filler, can be calculated when S_f is known.

As an example, consider a sheet of paper made from the same fiber as the one considered above but containing 10 per cent filler. Suppose that it is found that $C_{.98}$=0.87 and R_∞=0.85. The basis weight is 20 pounds, as before. From the curves SX is found to be 4.3. S=4.3/20=0.215. y=0.1. S_f=0.15. Substituting in the equation, S_p= 0.80. Thus is the S-value of the pigment in the paper determined.

The S-value of a pigment determined in this way in a commercial sheet should be regarded, not as a basic evaluation of the pigment, but rather as a measure of how effective the pigment is in that particular sample. The S-value of a pigment can and does vary greatly, depending upon the conditions of its use. In fact, it is partly for this reason that the method should be useful to the paper manufacturer. It will enable him to determine whether a pigment is giving the results it should, and to measure accurately the effects of changes in his manufacturing routine.

The S-Value of Various Pigments and Fillers

Since the S-value of a pigment varies with the conditions of its use, it is not possible to state the absolute S-value of the various pigments and fillers. At the same time, the S-value of opacifying pigments must always be higher than that of inerts; therein lies the justification of their use. The following approximate values are presented merely as a matter of general information and interest, in no sense as a basis for their comparative evaluation.

Clay	.70
Lithopone	.95
50 per cent zinc sulphide-barium pigment	1.15
Titanated lithopone	1.15
Zinc sulphide	1.45
TiO_2	2.20

In this connection, it is interesting to note that the opacifying power of zinc sulphide is approximately ten times that of bleached sulphite fiber. A sulphite sheet containing 10 per cent zinc sulphide owes fully one-half its opacity to the pigment.

Other applications of this general method will suggest themselves. The opacifying power of coatings can be determined in precisely the same way and studies on waxed paper present no peculiar difficulties. In the latter case, all of the S-values are much lowered. The waxed S-value of bleached sulphite pulp is about 0.024, and of zinc sulphide about 0.65. In dealing with waxed paper the basis weight and pigment analyses are always expressed on basis of the unwaxed sheet.

Colored papers can be studied by this method only if the optical measurements are made with monochromatic light. When white light is used these relationships hold only for white, or nearly white, and grey papers.

With very heavy or very light papers it is sometimes necessary to use the curves shown in Fig. 2 of the original article, these curves being merely extensions of the set reproduced here.

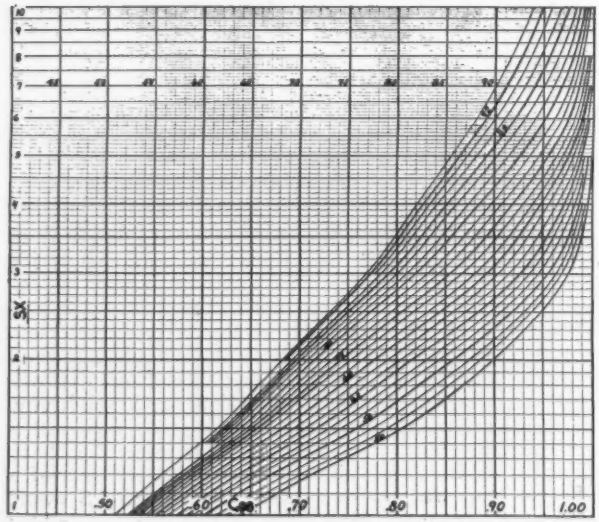

FIG. 1

(1) Steele, F. A., *Paper Trade J.*, 100, No. 12:37 (Mar. 21, 1935).

Obituary

George Hale Lowe

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., February 22, 1937—George Hale Lowe, a former member of the firm of Carter, Rice & Co., Corp., died February 10 at the home of his daughter, Mrs. Myron L. Crowe, Duxbury, Mass., in his 82nd year.

Mr. Lowe was born in Bridgewater, Mass., February 28, 1855, one of ten children of Dr. Lewis G. Lowe and Joanna Jackson of Plymouth, and grandson of Dr. Abraham T. Lowe, of Ashby. Through his mother, he was a direct descendant of Governor William Bradford, of Plymouth Colony.

He was graduated from the old Bridgewater Academy at sixteen. He received an appointment for West Point, but failed on account of defective eyesight. Mr. Lowe entered Carter, Rice & Co., Corp., at sixteen in Spring Lane. He married Mary Wastell Morse of Boston at the new Trinity Church, Boston, with the Rev. Phillips Brooks performing the ceremony. This was the beginning of his connection with Trinity where he was bass soloist for many summers, singing in the choir under Horatio Parker for seventeen years, a great influence in his life.

About 1881, he removed to Worcester, Mass., and formed with James Logan the "Logan-Lowe" Envelope Company. In 1885, he returned to the Carter, Rice Company, entering the firm with James Richard Carter and Edward H. Palmer. He was secretary and then president, and chairman of the board of directors, retiring in 1929 on account of extreme ill health.

He was quiet in his tastes. He always played the violin, and took singing lessons, practicing at night. He loved his 'cello. He never missed a year in his attendance at the Boston Symphony concerts. He sang in the Apollo Club and the Handel and Haydn Society. At. St. Andrew's Church, Wellesley, Mass., he was director of the choir in which he sang, and later sang at the Wellesley Congregational Church, where he enjoyed the work under Thompson Stone. He was very happy in his Wellesley home, 33 Dover road, where he took pleasure in his garden. He always welcomed most cordially his own friends and those of his children. Mr. Lowe travelled three times to Europe, to Mexico, California, Jamaica and Bermuda.

Although most of Mr. Lowe's contemporaries have passed on, his long years of identification with the paper industry are remembered by many, both in the Carter, Rice Company and in the trade at large. His warm personality and sterling character endeared him to all.

He leaves two daughters, Mrs. Frank H. Winter, of Needham, Mass.; Mrs. Myron L. Crowe of Duxbury; a son, George H. Lowe, Jr., of Boston and Marshfield; nine grandchildren; two sisters, Mrs. John B. Gifford and Mrs. John F. Worcester; and two brothers, Gustavus J. Lowe and William Bradford Lowe. Mrs. Lowe died November 15, 1930.

J. Edward Sauer

[FROM OUR REGULAR CORRESPONDENT]

DAYTON, Ohio, February 22, 1937—J. Edward Sauer, 66 years old, former secretary and treasurer of the Seybold Machine Company, died recently at his residence on Schantz Avenue, Oakwood, following a relapse suffered when it appeared he was on the way to recovery from a paralytic stroke.

Mr. Sauer was widely-known in the trade, having served as an active official of the large Dayton plant when the late Charles Seybold was its president and active head. The two were inseparable and were largely responsible for the growth of the concern during the period of years they were together.

An energetic lodge man, Mr. Sauer belonged to the various branches of Masonry, being a 32nd degree member; to the Knights of Pythias; Benevolent and Protective Order of Elks; Fraternal Order of Eagles and the Dayton Gymnastic club. He was a member of the First English Lutheran Church.

Surviving are his widow, Mathilda; son, Edward A.; two daughters, Edith and Florence; and three grandchildren.

Robert B. McEwan

MONTCLAIR, N. J., February 22, 1937—Robert Bruce McEwan, president of R. B. McEwan & Son, paper manufacturers, died February 19 at his home here. Mr. McEwan has been an invalid for five years.

Born in Windsor Locks, Conn., Mr. McEwan established the paper mill in Whippany with seven brothers more than a half a century ago. With that and another mill operated by the McEwan brothers, the business supplied paper box board throughout the country. Recently both mills have been operated under the same name.

Mr. McEwan was a Mason and a member of the Order of the Mystic Shrine. A resident of Montclair for seven years, he previously lived in Whippany and Orange.

Surviving are two daughters, Mrs. Frank Leslie Porter of Montclair and Mrs. Alfred Lang of Lawrence, Mass.; three brothers, Arthur of Whippany, Fred of Morristown and Frank of Madison, and a sister, Mrs. W. G. Wilson of Morristown.

William Howarth

EVERETT, Wash., February 22, 1937—William Howarth, 73 years old, president and treasurer of the Everett Pulp and Paper Company and vice-president of the First National Bank, died February 13. Mr. Howarth came here more than forty years ago and was prominent in industrial and civic affairs.

William Cameron Haugh

[FROM OUR REGULAR CORRESPONDENT]

INDIANAPOLIS, Ind., February 22, 1937—William Cameron Haugh, 63 years old, for years a salesman for the Indiana Paper Company, died last week at his home. He was a native of the city and was the son of a prominent local business man. The widow and a son survive.

Mrs. Agnes M. Lindsay

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., February 22, 1937—Mrs. Agnes Morton Lindsay, widow of Edwin Arthur Lindsay, a prominent paper manufacturer, who was well known in Boston, died Tuesday at Dunedin, Fla., after a short illness. Mrs. Lindsay's home was on Clifton street, Belmont, Mass.

Eastern Envelope Chartered

[FROM OUR REGULAR CORRESPONDENT]

SPRINGFIELD, Mass., February 22, 1937—The Eastern Envelope Manufactory, Inc., has been incorporated with a capital stock of $10,000. There are 100 shares, $100 each and 250 common shares having no par value. Wellington G. Reynolds is president; John H. Preston, 9 Hadley street, South Hadley, Mass., treasurer, and Blon Hopkinson is the third incorporator.

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THE YEAR IN PAPER

Following the usual custom, a thorough analysis of the paper and pulp industry in North America for the past year is afforded in the Annual Review Section of this Convention Number of the PAPER TRADE JOURNAL. Different divisions of the industry have been concisely reviewed by representative leaders in their particular fields and the information derived may be depended upon to be thoroughly accurate and trustworthy in every respect

Paper production in the United States in 1936 reached a new high level for all time. The estimated output amounted to 11,843,000 tons, as compared with 10,506,000 tons in 1935 and with the previous high record of 11,140,000 tons in 1929. The new highs were confined largely to kraft wrapping paper and paper board, but printing papers, including book, cover and writings, generally made gains corresponding to the gain in the volume of general business, but did not reach the 1929 levels.

For the year as a whole, the entire paper industry averaged 82 per cent operation of capacity. In the late Fall, when increased demand was definitely under way the industry was operating at 88 per cent of capacity, from which there has been little change to date. There are now being built machines with an annual capacity of 488,000 tons of board and 155,000 tons of kraft wrapping paper.

The position of the newsprint paper industry improved materially during 1936. Although production was much in excess of any previous period in the history of the industry, the mills experienced some difficulty in keeping up with orders, so great was the demand from newspaper publishers. The price situation, also, is showing signs of improvement. Despite the fact that an increase of only $1.50 per ton is in effect for 1937, it is said that there are publishers who today would be willing to pay even more for current needs if they could be assured of the same advanced price prevailing for 1938.

The book paper industry for 1936 continued to show improvement over 1935, which in turn registered a gain over 1934. Production of book paper increased 16 per cent over the output of the preceding year. The uncoated production was 14.7 per cent and the coated paper 22 per cent higher. The operating rate for uncoated paper was 77 per cent of capacity and for coated paper 74 per cent, compared with 67 per cent and 60 per cent respectively for 1935. There were no new machines installed during the year. Prices advanced in the middle of November and again in the middle of January, 1937, but are still considered not high enough to meet the increased costs of raw materials and labor.

Writing paper production increased from 417,859 tons in 1934 to 481,083 tons in 1935 and 568,000 tons in 1936, which is still below the 1929 peak production of 607,590 tons. Production, as compared with practical capacity of the writing paper industry was 59 per cent in 1934, 68 per cent in 1935 and 78 per cent in 1936. In 1929 the industry, with a somewhat smaller capacity, was operating at 91 per cent. No new machines have been added for writing paper but the capacity has been increased by about 20,000 tons per year by improvements to existing machines.

Demand for kraft paper has been gradually increasing for some years past and in the Fall of 1936 the industry found itself confronted with two new problems, one a material increase in the cost of producing paper and the other an unusually large increase in the demand for its product. With costs of raw material and labor still advancing it is natural to assume that there will be further price increases in the near future.

Regarding the operation of the kraft paper and board mills which are now being built, or have been announced for building in the South, the increased output will be absorbed by the market if the rate of increase in consumption which has prevailed since 1934 continues through the next two years, or more.

The paper board industry during 1936 displayed an improvement which surpassed the optimistic forecasts made at the beginning of the year. Production reached a new high level and improvement was experienced in plant efficiency and general price levels. Demand for the various grades of paper board in the first quarter of the year increased 6 per cent over the corresponding period of 1935. The half-year mark showed a 10 per cent gain and the year closed with an estimated 17 per cent growth. Prices of the principal grades of paper board have advanced $5 per ton since January, 1936. This increase, however, is considered insufficient to compensate for the increase in the cost of raw materials.

The past year will go down in history as the greatest year in regard to the production and distribution of wood pulp. While all kinds of pulp were in brisk demand, kraft and bleached sulphite pulps enjoyed a boom during the latter half of the year. Prices on imported chemical pulp advanced materially and this situation had a tendency to encourage the expansion of the wood pulp industry in the South and elsewhere. The United States led the world in production last year, with Canada second and Sweden third.

It will readily be seen by the reviews presented in this Convention Number that great progress was made during the past year towards stability. The price structure is decidedly firmer and cut-throat competition has been practically eliminated. Stocks at the paper mills and in merchant's warehouses are below normal and the prevailing demand is already more persistent than in the preceding year. Altogether, the outlook for the paper industry in 1937 is considered exceedingly bright.

Consolidated Wage Increases

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., February 22, 1937—Effective February 14, wage increases aggregating $80,000 annually were put into effect by the Consolidated Water Power and Paper Company at its four mills at Wisconsin Rapids, Stevens Point, Biron and Appleton, Wis. A new agreement was reached following a wage conference February 10 with the pulp and sulphite workers', papermakers', mechanics' and electricians' unions, all affiliates of the American Federation of Labor.

The agreement provides for a flat increase of five cents perhour for machine and beater room employees; three cents for other male workers employed on an hourly basis, and two cents for women workers. The basic rate for labor was established at 46 cents per hour. A resolution adopted at the opening of the meeting guaranteed the unions have no connection with C.I.O. and will continue their A. F. of L. affiliation.

Flood Protection for Paper Mills

[FROM OUR REGULAR CORRESPONDENT]

HOLYOKE, Mass., February 23, 1937—Plans for the protection of the paper mills on the river bank from further disaster by high flood waters are being worked out by the army engineers at Providence, R. I. There are three sections to the work and each paper mill has a separate problem to be worked out. When the work is completed Holyoke's mills will be insured against any flood loss for all time to come.

The paper mills so protected will include the Valley Paper Company, the Mt. Tom, Parsons, Albion, Nonotuck and Crocker Divisions of the American Writing Paper Company, Hampden Glazed Paper Company, Advertisers Paper Mills, Newton Paper Company, Franklin Paper Company, New York and New England Company, Taylor-Logan Company and Chemical Paper Manufacturing Company.

Allied to Improve Power Plant

[FROM OUR REGULAR CORRESPONDENT]

KALAMAZOO, Mich., February 22, 1937 — A complete rebuilding of the power plant at the Monarch Division of the Allied Paper Mills is under way and when finished will bring the plant up to the standard of efficiency to compare with other units of the company.

The new installation consists of a 2000 KW turbo generator set 2500 KVP, 3600 RPM, 400 lb. gauge pressure, 600 deg. temperature at throttle; a 500 KW D. C. motor generator set, two 40,000 lb. per hour pulverized fuel boilers.

These improvements will take the place of a 9-unit boiler plant and six or seven reciprocating engines. The new installation is expected to be completed by March 15.

Production Ratio Report

The following statistics are based upon paper production reports to the American Paper and Pulp Association:

COMPARATIVE MONTHLY SUMMARIES

Months	1937	1936	1935	1934
January	90.2% (c)	76.1%	65.8%	.....
February	.....	77.9%	70.0%	.....
March	.....	76.0%	70.5%	.....
April	.....	82.3%	70.0%	.....
May	.....	81.6%	69.4%	.....
June	.....	80.7%	72.3%	.....
July	.....	77.3%	64.9%	.....
August	.....	81.5%	70.9%	.....
September	.....	80.5%	71.9%	58.2%
October	.....	87.6%	75.6%	64.7%
November	.....	88.0%	75.3%	61.7%
December	.....	85.9%	71.2%	59.6%
Year Average	.....	81.3%	70.5%	.....
Year to Date First 6 weeks	89.7% (c)	76.4%	66.4%	.....

COMPARATIVE WEEKLY SUMMARIES

CURRENT WEEKS, 1937		CORRESPONDING WEEKS, 1936	
*January 9	92.1%	January 11	75.8%
*January 16	90.2% (c)	January 18	77.1%
*January 23	88.9% (c)	January 25	76.7%
*January 30	89.6% (c)	February 1	78.6%
*February 6	87.9% (c)	February 8	77.5%
*February 13	89.2% (c)	February 15	77.0%

The following statistics show the number of mills reporting by ratio groups:

	Number of Mills Reporting, Current Weeks					
Ratio Limits	Jan. 9, 1937	Jan. 16, 1937	Jan. 23, 1937	Jan. 30, 1937	Feb. 6, 1937	Feb. 13, 1937
0% to 50%	49	53	53	45	42	25
51% to 100%	281	276	277	266	261	187
Total Mills Reporting	330	329	330	311	303	212

* Subject to revision until all reports are received.
(c) Basic capacity data have been adjusted to correspond with ratings reported on January 4, 1937 Machine Improvement Survey.

PAPERBOARD OPERATING RATIOS

According to reports from the National Paperboard Association, per cents of operation, based on "Inch-Hours", were as follows:

Months	1936	1935	1934	Months	1936	1935	1934
January	61%	61%	....	July	69%	59%	....
February	67%	67%	....	August	75%	65%	....
March	68%	67%	....	September	76%	69%	62%
April	70%	61%	....	October	82%	76%	63%
May	68%	61%	....	November	79%	70%	56%
June	68%	65%	....	December	74%	60%	52%

Week ending Jan. 9, 1937—77%
Week ending Jan. 16, 1937—79%
Week ending Jan. 23, 1937—82%
Week ending Jan. 30, 1937—81%
Week ending Feb. 6, 1937—86%
Week ending Feb. 13, 1937—86%

Bids For Government Paper

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., February 24, 1937 — The Government Printing Office has received the following bids for 15,350 pounds (50,000 sheets) of 50 per cent rag double coated book paper; R. P. Andrews Paper Company, 15 cents; and Edgewater Paper Company, 15.11 cents.

For 9,900 pounds (75,000 sheets) of 26 x 34", 50 per cent rag, white bond paper; Old Dominion Paper Company, 13.389 cents; Barton, Duer & Koch Paper Company, 13.4 cents; Mathers-Lamm Paper Company, 17.5 cents; and J. R. Howarth Paper Company, 17.5 cents.

For 500 pounds of specially treated Tympan paper; Whitaker Paper Company, 8.1 cents; Mathers-Lamm Paper Company, 8.5 cents; R. P. Andrews Paper Company, 8 cents; and Cromwell Paper Company, 7.75 cents and 6.75 cents.

L. L. Brown Appoints Alabama Agent

The Jefferson Paper Company, of Birmingham, Alabama, has been appointed an agent in that territory for Brown's linen ledger, the 100 per cent white linen and cotton permanent record paper made by the L. L. Brown Paper Company of Adams, Mass.

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